AD-E410232

AD

ADA081007

CHEMICAL SYSTEMS LABORATORY SPECIAL PUBLICATION

ARCSL-SP-80001

STYLE GUIDE FOR TECHNICAL PUBLICATIONS

Prepared by

Floyd W. Noye
Henry J. Bielecki

Technical Releases Branch
Developmental Support Division

LEVEL II

DDC FILE COPY

DTIC
ELECTE
FEB 25 1980
S D
A

December 1979

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND
Chemical Systems Laboratory
Aberdeen Proving Ground, Maryland 21010

Approved for public release; distribution unlimited.

80 2 15 030

Disclaimer

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

Disposition

Destroy this report when no longer needed. Do not return it to the originator.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: ARCSL-SP-80001
2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle): STYLE GUIDE FOR TECHNICAL PUBLICATIONS

5. TYPE OF REPORT & PERIOD COVERED: Special Publication

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s): Floyd W. Noye, Henry J. Bielecki

8. CONTRACT OR GRANT NUMBER(s)

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Commander/Director, Chemical Systems Laboratory
ATTN: DRDAR-CLJ-R
Aberdeen Proving Ground, Maryland 21010

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: 1L1625

11. CONTROLLING OFFICE NAME AND ADDRESS
Commander/Director, Chemical Systems Laboratory
ATTN: DRDAR-CLJ-R
Aberdeen Proving Ground, Maryland 21010

12. REPORT DATE: December 1979

13. NUMBER OF PAGES

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)
USAMSAA
AD-E410 232

15. SECURITY CLASS. (of this report): UNCLASSIFIED

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE: NA

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)
Technical reporting
Reports format
Publication style
Writing style

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This publication is a guide for the writing, editing, and type composition of technical reports at the US Army Armament Research and Development Command's Chemical Systems Laboratory. It is designed for use by authors (both in-house and contractor), contract project officers, managers, supervisors, editors, writer/editors, and typists.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

410170

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

PREFACE

This style guide is intended to provide information to authors, contract project officers, managers, supervisors, editors, writer/editors, typists, and composers* who are engaged in preparing various types of Chemical Systems Laboratory technical reports for publication. Although it addresses many of the aspects of preparing and processing technical information, this publication cannot be all encompassing. For supplementary guidance on such problems as capitalization, hyphenation, and compound words, the user is referred to the Government Printing Office Style Manual or a good standard dictionary.

Directive guidance on administrative and policy matters is contained in:

DoD Directive 5100.36, Department of Defense Technical Information.

DoD Directive 5200.20, Distribution Statements on Technical Documents.

MIL-STD-847A, Format Requirements for Scientific and Technical Reports Prepared by and for the Department of Defense.

AR 70-31, Standards for Technical Reporting, and ARRADCOM Supplement 1.

AR 310-25, Dictionary of US Army Terms.

CSL Standing Operating Procedure No. 70-5, Technical Reporting.

For security guidance, see DoD 5200.1-R, Information Security Program Regulation; AR 380-5; and AR 380-86.

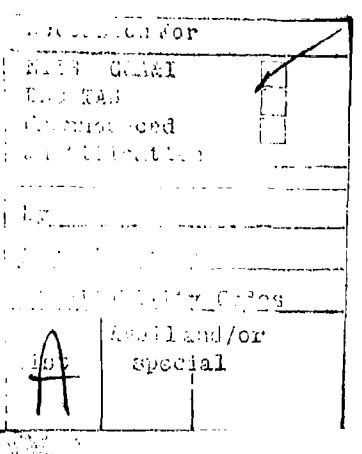
Acknowledgments

The authors wish to acknowledge the technical and editorial contributions of Dr. Paul A. Parent, Mrs. Edna L. Mueller, and Mrs. Rovena C. Holmes, as well as the excellent type composition efforts of Mrs. Martha E. Lefridge.

*The term "composer" in this publication refers to a typist operating word processing equipment in the preparation of camera-ready copy (printing masters) for offset printing.

CONTENTS

LIST OF FIGURES



STYLE GUIDE FOR TECHNICAL PUBLICATIONS

1. INTRODUCTION

This publication is intended primarily to serve as a guide for authors, contract project officers, writer/editors, editors, and typists in preparing effective technical reports. The objective is to achieve a fairly standardized style of presentation of technical information.

In any effective technical publishing activity, the author (or contract project officer), writer/editor, composer, editor, and typist work as a team.

The overall responsibility for an in-house-generated report and its content belongs to the author. It is the author's credibility and reputation that stand trial with each publication. The author is the expert on the subject matter and therefore must be accorded the full responsibility and pride of parentage. In report writing, the author must communicate information that is usually complex and new to most or all of the readers. This places upon the author a requirement for clarity, accuracy, logical exposition, and completeness.

The editor serves the author by assuring that the information is logically developed, easily understood, and complete. Embarrassing errors and ambiguities are among the editor's principal targets, along with correct format and compliance with policy. Clear, correct sentence structure is an editorial concern, but caution should be used against over-editing – each author is entitled to reasonable originality and individualism in writing.

The editor serves the composer by providing a manuscript that (a) bears readily-understood editorial markings, (b) has been completely edited, (c) has had all technical questions resolved by the author, and (d) has no missing parts.

In addition, the editor has a responsibility to the Commander/Director for adherence to administrative, security, and technical information policies involved in publishing reports.

The composer's contributions to producing effective technical reports include (a) refining the manuscript into a high-quality typographic product and (b) providing suggestions and advice to the editor and author on ways to improve layout and general presentation of the report's content.

2. REPORT CATEGORIES

Five types of CSL technical information documents are published.

2.1 Technical Reports (TR's) are permanent official records of the results of research and development (and related scientific and technical work) and are the principal means of disseminating new information throughout the Department of Defense, other Government agencies, and the scientific and technical community.

PRECEDING PAGE NOT FILMED
BLANK

2.2 Contractor Reports (CR's) are contractor-prepared reports having the same purpose and importance as TR's.

2.3 Special Publications (SP's) contain technical information of long-term record or reference value not falling within the TR category. An SP may contain such material as essential laboratory data for reference, information on overseas trips, special compilations of information, compendiums, literature surveys, and records of conferences and symposiums.

2.4 Special Reports (SR's) contain administrative guidance of a technical nature. An SR may be a description of a manufacturing process, a report of laboratory capabilities, or other information on which to base management decision-making. An SR is characterized by its administrative distribution and specificity of purpose.

2.5 Technical Memorandums (TM's) are used to disseminate research and development information quickly to meet current operational needs. A TM is a temporary document for use during the course of a project. Information of lasting value in a TM is normally included in a final formal report. (ARRADCOM Supplement 1 to AR 70-31, page 2, paragraph 5f).

3. FORMAT GUIDANCE

3.1 References: MIL-STD-847A, Format Requirements for Scientific and Technical Reports Prepared by or for the Department of Defense; AR 70-31, Standards for Technical Reporting, and ARRADCOM Supplement 1; and CSL Standing Operating Procedure 70-5, Technical Reporting. (The order of elements of a report is shown in the table in CSL SOP 70-5.) Generally, the decimal system used in this guide will be used in all reports.

3.2 Front cover. Sample front covers are shown in appendix A as figures A-1, Technical Report; A-2, classified report; A-3, Contractor Report; and A-4, Technical Memorandum. The cover format for a Special Publication is similar to that for a Technical Report. Special Report and Technical Memorandum covers vary with the nature of each report.

3.2.1 Numbering of reports. All ARRADCOM/CSL report series numbers are assigned by the Chief, Technical Releases Branch, Developmental Support Division. The Defense Documentation Center (DDC) assigns AD (accession) numbers (figure A-1) when DDC receives the printed copies of reports for secondary distribution.

3.2.2 Main title. The title should describe the contents of the reports as briefly and explicitly as possible.

3.2.3 Date. The date, representing the month and year in which the printing masters of the report are forwarded for printing, is designated by the Chief, Technical Releases Branch, Developmental Support Division.

3.2.4 ARRADCOM seal and logo. The logo designating the document as an ARRADCOM-CSL report is furnished by the Chief, Technical Releases Branch, Developmental Support Division.

3.2.5 The Technical Cooperation Program (TTCP) statement, designating TTCP-approved reports, appears on the front cover (figure A-5).

3.2.6 Names of author(s) and parent division or contracting firm are centered below the title (figures A-1 and A-3).

3.2.7 Security markings are applied to the front cover in accordance with AR 380-5 and AR 380-6.

3.3 Reverse of front cover bears two standard administrative statements (the disclaimer and disposition instructions). See CSL SOP 70-5.

3.4 DD Form 1473, Report Documentation Page (figures A-6 and A-7) is the first (right-hand, unnumbered) page of a Technical Report, Contractor Report, and Special Publication. It is optional for Special Reports. The DD Form 1473 is used DoD-wide for preparing announcements, bibliographies, and data banks, and should be unclassified if possible. Instructions for its preparation are attached to each form; the form is prepared by the author or contract project officer.

3.4.1 Keywords. Keywords entered on the DD Form 1473 should be selected so that the grouping will be unclassified, if possible. When appropriate, the security classification symbol will be shown at the beginning of the listing. Keywords are used for information retrieval and should be selected carefully so as to be meaningful.

3.4.2 Abstract. The abstract of a report, entered on the DD Form 1473, should be informative and should include the objective, approaches, significant results, and conclusions. (A collection of currently-published Report Documentation Pages containing the abstracts is published quarterly by Technical Releases Branch as a Special Publication and is distributed widely for information purposes.) When appropriate, the security classification symbol is shown at the beginning of each abstract.

3.5 Summary. A summary is optional. It may be used if the author desires to present more information in brief form than that contained in the abstract on the DD Form 1473. But a summary should not be a duplication of the abstract. When used, the summary appears as numbered page 2 unless the DD Form 1473 requires a second page – in which case the summary becomes page 3.

3.6 Preface. The preface to a report will normally appear on page 2 – that is, if the DD Form 1473 (unnumbered page 1) does not require a second page and if no summary is used. The preface immediately precedes the table of contents, but not necessarily as a facing page.

3.6.1 Required administrative and policy statements to be included in the Preface are shown in figure 3, CSL SOP 70-5, Technical Reporting. If the report has not been cleared for release to

the public, the statement, "The information in this document has not been cleared for release to the public", appears as a separate paragraph at the end of the Preface proper -- normally immediately preceding "Acknowledgments".

3.6.2 Acknowledgments of significant contributions of others not listed as authors appear at the end of the Preface under the subhead, "Acknowledgments" (figure 3, CSL SOP 70-5). Acknowledgment should be reserved for those who provided unusual or specialized help but the spirit of appreciation should not be diluted by including the names of persons who only did their jobs.

3.7 Table of contents appears on an odd-numbered (right-hand) page immediately preceding the body of the report. In reports containing less than 10 pages, the table of contents is optional. See MIL-STD-847A and figure A-8. It is headed, "CONTENTS".

3.8 Lists of figures and tables are included as a continuation of the table of contents (figure A-8). If the figures or tables are fewer than five (in either case), listing is optional. Tables and figures appearing as appendixes are not necessarily listed with the table of contents, particularly if they are numerous; however, each appendix may have such a listing. Tables and figures are numbered consecutively within the body of the report and within each appendix (for example, in the text: figure 1, figure 2, table 1, table 2, etc.; in appendixes: figure A-1, figure A-2, table B-1, table B-2, etc.).

3.9 Body of the report. A technical report is a systematic presentation of the results obtained in the investigation of a specific subject. In general, the body of the report should include an introduction, materials and methods, investigational procedures and results, a discussion of the results, and conclusions. However, circumstances may justify altering these elements or eliminating some. The body begins on an odd-numbered (right-hand) page, with the report title at the top of the page. The order of elements of a report is given in CSL SOP 70-5.

3.9.1 Introduction. The introduction states the problem and its background, reviews the status of the problem at the start of the investigation, and outlines the scope of the investigation. The introduction sets the stage for what is to follow.

3.9.2 Materials and methods. Sometimes there will be no need for a separate section to discuss materials and methods. But this information should be included if the methods are unusual or unique, or if the materials may be unfamiliar to the reader. Whether or not this subject can best be treated with the investigational procedures and results will depend upon the nature of the report.

3.9.3 Investigational procedures and results. This is a brief description of the work done and the most important results obtained. Only information that the reader requires for understanding the conclusions need be included. More extensive results or detailed records should appear in the appendixes. Numerous pages of tables or figures particularly should be arranged as appendixes; they interrupt the text and interfere with the reader's rapid comprehension of the results.

3.9.4 Discussion. The results are analyzed, interpreted, and discussed in this section. Evaluation of the results and determination of their significance take place here. Often the results can be discussed as they are presented in the preceding paragraph 3.9.3 to prevent duplication.

3.9.5 Conclusions of a report constitute the essence of the author's interpretation of the results. The most important section of the report, it deserves special care in formulation. The author should prepare brief, clear statements of the answers to the questions implied in the introduction.

3.10 Literature Cited, Selected References, Bibliography. These elements of a report will be prepared as separate sections (figure A-9) with the first page of each section beginning on an odd-numbered (right-hand) page. Literature citations, selected references, and bibliographies are given principally to show what literature has been studied; to separate borrowed material from the writer's own and to acknowledge the former; and to permit the reader to make verification or to read further.

3.10.1 Literature cited. In the text, the literature cited will be indicated by sequential Arabic numerals as superscripts immediately after the word or phrase to which the reference applies. If it is necessary to repeat a citation, the number originally assigned will be used again. These numbers will be keyed to the listings in the Literature Cited section in matching sequence. If there are not more than four references cited in the body of the report, they should be listed as footnotes at the bottom of each page where reference is made.

3.10.2 References to "personal communications" and other unpublished data. This kind of information is not available to the reader and should be used judiciously. It should not be listed in the "Literature Cited" section. However, it may be documented within the text. Material that has been prepared for publication but not yet issued may be referred to in the text as in these examples:

> "Similar data have been obtained by John E. Fox, Research Division, CSL (unpublished data, June 1979)."
>
> "Dr. H.L. Schmidt, Research Division, CSL, has recently corrobated these findings (unpublished data, July 1979)."

Personal communications should be noted parenthetically in the text as in these examples:

> ". . . in direct line with the base (written communication, J.P. Whiting, Physical Protection Division, CSL, February 1979)."
>
> ". . . 90 meters downwind (conversation with J.J. Watson, CB Detection and Alarms Division, CSL, March 1979)."

3.10.3 Selected references. This section may be added to a report if it is desirable to list all known pertinent literature for further reading. Selected references are not referenced in the text but reference may be included parenthetically in appropriate circumstances; example: "(See Selected References, entry 3)".

3.10.4 Bibliography. If the author feels that it is necessary to list all known work previously written on a subject, the section will be titled: Bibliography. Bibliographic entries are arranged alphabetically by last name of the author or, if the author is unknown, the first word in the title (ignoring the articles "a", "an", and "the").

3.10.5 Source locator data. Literature citations, selected references, and bibliographies will contain all data possible to enable the reader to locate the source (figure A-9), including the name of the proponent agency, contractor, or publisher.

3.10.6 Report classification designators. Literature citations of technical reports, contractor reports, and special publications will indicate levels of classification (figure A-9).

3.11 Glossary. Unfamiliar abbreviations, terms, and symbols used in a report should be listed in a glossary if they are not defined in the text or if they are so numerous that the reader would require such a list for clarity and understanding (figures A-10 and A-11). A limited number of these may be defined in parentheses or in footnotes to the text. If the definitions are contained in a glossary, definitions in the body of the report are unnecessary.

3.12 Appendixes. Detailed data and information, if voluminous or highly specialized, will be contained in one or more appendixes and will be presented in the body of the report in summary form only. Each appendix will be keyed to the text by a specific reference in the body of the report. Some examples of information included in appendixes: illustrations, detailed tabulated data, test plans, sample forms or data sheets, derivations of equations, sample calculations, and detailed descriptions of equipment or procedures when the body of the report contains only a general description.

3.12.1 Appendix format. Each appendix will have a title and will begin on an odd-numbered page (figure A-12). If there is only one appendix, it is called simply the "Appendix"; if there are more than one, each is identified alphabetically and in the order in which they are cited in the text (appendix A, appendix B, etc.). Figures contained in an appendix are numbered accordingly (e.g., Figure A-5, B-3); tables are numbered similarly (e.g., Table A-1, B-6). All pages of an appendix, except the first, will bear the appropriate appendix designation (Appendix A, Appendix B, etc.) at the lower left margin (figure A-12) opposite the folio number.

3.12.2 Multiple appendixes. When a report contains more than one appendix, a title page (figure A-13) will be used to introduce the appendix section of the document.

4. ILLUSTRATIONS

4.1 General. The value of illustrations – photographs, graphs, and line drawings – as an aid to an understanding of the text should be considered carefully. See MIL-STD-847A, Format Requirements for Scientific and Technical Reports by or for the Department of Defense.

4.2 Placement. Illustrations should be located as closely as possible after the first text reference unless the illustrations are so numerous in relation to text pages that they should be incorporated as appendixes (see paragraphs 3.12, 3.12.1, and 3.12.2). Effort should be made to place illustrations vertically on a page to avoid causing the reader to turn the report sideways.

4.3 Printing in colors in reports is an expensive process and can only be justified when the color is functionally essential to the illustration. An example is to photographically show discoloration of tissue. On graphs, a substitute for using color is the use of screens, crosshatching, shading, or dots. See MIL-STD-847A and AR 310-1, paragraph 2-33.

4.4 Foldouts. Oversize illustrations and tables that must be folded out of a printed report should be avoided whenever possible. Sometimes an oversize illustration can be prepared as a two-page spread on facing pages, but care must be taken to insure that the columns and lines are true across both pages.

4.5 Photographs. For best printing reproduction, good 8 by 10-inch, black-and-white, glossy photographs should be used. Color prints with good definition of detail will suffice if original black-and-white photographs cannot be obtained.

4.5.1 Identifying photographic illustrations. Photographic illustrations in a report are identified for the reader by Arabic number and title: "Figure 1. Smoke Cloud Erected in Test 1", or, if appearing in an appendix, "Figure A-1. Smoke Cloud Erected in Test 1". Number and title of a photographic illustration appear *below* the picture. Photo illustrations are keyed into the text as, for example, (figure 3) or (figure A-2) immediately following each reference.

4.5.2 Callouts. When callouts (labels identifying parts of a photo illustration) are used, they are placed horizontally and as close as possible to the parts they identify. Callouts on photos to be reduced must be large enough to be legible after reduction.

4.6 Line drawings. Line drawings (figure A-14) should be carefully planned and should be free from any unnecessary detail. Callouts and values must be located as near the components as possible, with sufficient white background space for easy reading. If the parts to be identified are too numerous, thus cluttering the illustration, a legend keyed to the drawn parts will be necessary. Line drawings are identified in a report in the same manner as photographic illustrations (paragraph 4.5.1). They are also designated "figures".

4.7 Graphs. The function of a graph (figure A-15) is to present an idea in readily understood form. A graph should be used when it will convey information and portray significant features more efficiently than words or tabulations. When two or more curves are plotted on one graph, they must be distinguished by simple legends on the curves or a clearly explained key. Too many curves should not be placed on one graph or the original purpose of the graph (to give a quick picture of data and relationships) will be defeated. The spacing of lettering must be carefully planned so that photographic reduction during reproduction will not destroy legibility. All lettering should be in capitals. Graphs are identified in a report in the same manner as photos and line drawings (paragraph 4.5.1) and are designated as "figures".

4.8 Reduction of figures. Many photo illustrations, line drawings, and graphs can be reduced to fit into the text as shown in figure A-16. Reduction should be considered wherever it can be done without loss of important detail. This is normally an editorial decision in considering layout.

4.9 Tables. Tables are a convenient method of presenting a body of precise quantitative data in easily understood form (figure A-17). Each table, however, must be so logical in design and so unencumbered by extraneous details that the reader will understand immediately the relationships to be conveyed. The data should be arranged so that one can read across the page from left to right and from the top down. The independent or most important variable should appear in the left (first) column; the dependent variables will appear in columns to the right in order of descending importance. Data should be presented so as to show magnitudes, to indicate trends, to facilitate comparisons, and to help the reader to grasp their significance.

4.9.1 Completeness of data in tables. No column of data should be included unless it has a direct bearing on the subject or is specifically cited in the text. If the value is zero, the table should so indicate; if the data are missing, an explanation must be included as a footnote; and if the data are not applicable, a dash should be inserted in the appropriate place. The footnote symbol should be placed after the number or word to which it refers. Footnotes providing supplementary comments, however, should be used sparingly.

4.9.2 Oversize tables. Tables that are too wide or too long for the standard page may be handled in several ways:

(a) The table may be divided into smaller ones, especially when the data in one portion need not be carefully compared with those in another portion.

(b) The table may be continued on the next page. The continuation must have the same headings as the original, and the columns must align exactly.

(c) The table may be prepared as a two-page spread, with the two pages facing each other and with the lines true across both pages.

(d) Foldouts may be used in certain cases, but should be avoided if possible. When unavoidable, the foldout should begin on a right-hand page and is numbered as one page.

(e) The table may be reduced photographically. Care must be taken, however, to insure legibility of the reduced copy. The reduction should be 50% or less.

4.9.3 Placement of the table. A table forming an integral part of the presentation should be placed in the text as closely as possible after the first reference to it. Numerous tables should be considered for placement in an appendix.

4.9.4 Identifying tables. Tables will be numbered consecutively with Arabic numerals. Numbers and titles will be placed above the tables (figure A-17). Tables within appendixes will be numbered according to the appendix designations, as: "Table A-1", "Table A-10". Tables used

in appendixes will be keyed into the text by placing the number so as to immediately follow the first reference. Titles and headings should be clear and brief, but descriptive.

4.9.5 Retyping of tables. When manuscript tables are in acceptable reproduction condition, requiring little or no editing, editors will arrange them for publication without retyping.

5. EQUATIONS AND FORMULAS

5.1 Style. Mathematical and chemical equations and formulas are used extensively in CSL technical reports. It is therefore desirable that the conventions of the American Chemical Society be followed for nomenclature, spelling, hyphenation, capitalization, and parentheses.

5.2 Legibility. All symbols in the equations and formulas should be completely legible (figure A-18). Subscripts, superscripts, and prime marks are best indicated by careful placement in relation to the basic symbol. Upper- and lower-case letters; zero and the letter O; numeral one, the letter l, and the prime mark; Greek and similarly-shaped English letters – all these must be distinct, particularly when they are handwritten by the authors. It is best that equations and formulas be composed by typewriter for submission for publication processing in manuscripts. Each sign and symbol must be placed accurately in relation to the others, with subscripts or superscripts placed half a line below or above the main line. Sub-subscripts are placed half a line below the subscripts. Equal signs are placed on the same line as horizontal fraction bars. The fraction bar should be exactly as long as the longer term, numerator or denominator, and both terms should be centered on the bar.

5.3 General rules. Guidance that may be helpful in preparing equations is given in the following subparagraphs:

5.3.1 Each equation should be centered on a separate line (figure A-18).

5.3.2 Equations should be numbered consecutively with Arabic numerals in parentheses at the right margin.

5.3.3 A long equation should be divided by breaking it before the plus or minus sign. The equal sign is to be clear on the left of other beginning mathematical signs.

5.3.4 Part of an equation should *not* be carried over to the next page.

5.3.5 Ample space should be allowed before and after the equation: three or four spaces above and below, or even more if it is necessary to use symbols of more than letter height.

5.3.6 Punctuation should not be used after an equation.

5.3.7 All symbols should be defined.

5.3.8 A short equation in text should not be broken at the end of a line. The line should be spaced out so that the equation will begin on the next line. Or better, the equation should be centered on a line by itself.

5.3.9 An equation too long for one line is set flush on the left, the second half of the equation is set flush on the right, and the two parts are balanced as nearly as possible.

5.3.10 Two or more equations in series are aligned on the equal signs and centered on the longest equation in the group.

5.3.11 Connecting words of explanation (such as hence, therefore, and similarly) are placed on a separate line.

5.3.12 Parentheses, braces, brackets, integral signs, and summation signs should be of the same height as the mathematical expressions they include.

5.3.13 Fractions in basic text should be set up with the slanting bar rather than the horizontal bar (e.g., AR/2 rather than $\frac{AR}{2}$). In equations, however, the form $\frac{AR}{2}$ is preferred.

5.3.14 When it is necessary to define more than three symbols used in an equation, the word "where" is set at the left margin two lines below the equation, and the first definition is placed two lines below "where", the definitions are aligned on the equal sign and are centered on the longest entry in the group.

6. ABBREVIATIONS

Abbreviations are used mainly to save space, especially in charts and tables. Space-saving is not as important in the text, so such words as hour, day, month, and year are normally written out. Standard abbreviations that are instantly recognized may be used in the text, especially when used with numerals (examples: 24 gm, 12 m^3). A list of CSL-approved abbreviations is given in appendix B; for other abbreviations, see the US Government Printing Style Manual. Some general guidance on the use of abbreviations is given in the following subparagraphs:

(a) Abbreviations of measure should be used only with numerals (e.g., "several meters", "12 m".

(b) Abbreviations of proper names should be spelled out at first mention, with the abbreviation given in parentheses – Chemical Systems Laboratory (CSL). Some abbreviations become acronyms or initialisms and, unless they have come into common use, should be similarly defined (see paragraphs 7 and 8).

(c) Abbreviations are ended with periods only if the abbreviation itself spells a word (or if the abbreviated form is ambiguous).

7. ACRONYMS

An acronym is a pronounceable word from the initial letter or letters of each of the successive parts or major parts of a compound term (radar: radio detecting and ranging). Although radar has become established in the language and requires no definition, other

acronyms arising from the inventive minds of government writers can be mysterious to many readers. "TECOM" poses no problem for CSL personnel but may not be readily identified by some Navy development engineer. The first mention should be the US Army Test and Evaluation Command (TECOM). (Also see "Initialisms, paragraph 8.)

8. INITIALISMS

Close relatives of abbreviations and acronyms are initialisms. "MTBF" (mean time between failures) may be said to be a type of abbreviation. "MTBF", however, does not form a word (in the sense of "laser" and "NATO") and must be considered an initialism. "MTBF" and similar groupings of initial letters certainly need defining at first usage in the text.

9. SYMBOLS, FORMULAS, AND CODE NAMES

9.1 General. These may be used in the text if they are well known. Otherwise, the term should be spelled out the first time it occurs and should be followed by the code name or symbol in parentheses. Symbols having several different meanings should be avoided to prevent ambiguity. Some terms have precise meanings of their own and cannot be adequately explained without undue discussion; among these are "pH" and "pK" and mathematical signs such as π and Σ. Such symbols, universally-approved chemical symbols, and standard chemical nomenclature will normally not have to be explained or spelled out.

9.2 Prefixes/symbols.

Multiples and submultiples		Prefixes	Symbols	Example with grams
1,000,000,000,000	10^{12}	tera	T	Tg
1,000,000,000	10^{9}	giga	G	Gg
1,000,000	10^{6}	mega	M	Mg
1,000	10^{3}	kilo	k	kg
100	10^{2}	hecto	h	hg
10	10	deca	dk	dkg
0.1	10^{-1}	deci	d	dg
0.01	10^{-2}	centi	c	cg
0.001	10^{-3}	milli	m	mg
0.000,001	10^{-6}	micro	μ	μg
0.000,000,001	10^{-9}	nano	n	ng
0.000,000,000,001	10^{-12}	pico	p	pg

9.3 Greek alphabet. The Greek alphabet (figure A-19) will demonstrate the formation of the letters which may be unfamiliar to some typists. The English equivalents of the Greek letters are also shown, illustrating the relationship between two alphabets -- and the potentiality for confusion. For example, it is easy to mistake the Greek ν (nu) for the English v. The two look very much alike, but ν corresponds to n rather to v. The distinction is important. A list of common symbols based on Greek letters follows and is arranged according to the order of the Greek alphabet.

α	Alpha particle Angle Linear expansion, thermal coefficient of Thermal diffusivity
β	Beta ray Volumetric expansion, thermal coefficient of
γ	Activity coefficient Surface tension
δ	Variation
Δ	Finite difference Increment
e	The number 2.7182818+; the base of the natural system of logarithms
η	Efficiency Viscosity, absolute; viscosity, coefficient
θ	Angle Temperature
λ	Latent heat of evaporation Wavelength
μ	Coefficient of viscosity Eccentricity dielectric constant Micron (0.001 millimeter) Micro- [0.000,001 of a (specified) unit] Permeability
ν	Frequency
π	Pi; the number 3.14159265+
Π	Product
ρ	Density
σ	Diameter of molecule Standard deviation Surface tension
Σ	Summation of
ϕ	Fluidity Function
Φ	Magnetic flux Function
χ	Function
ψ	Function
ω	Angular velocity Solid angle Ohm

9.4 Mathematical and Chemical Signs.

The symbols (sings) of mathematics and chemistry have well-established definitions. Care must be taken, therefore, to avoid confusing those symbols which are similar to each other, for example, $\therefore$ and $\because$, and to avoid taking them for similar symbols used in fields other than the one the writer is dealing with. It is also quite important that these symbols be placed exactly as the writer intends. The symbols may stand above the line, below the line, or on the line; the examples below indicate the normal placement.

9.4.1 Mathematical Signs.

$=$	Is equal to, equals $a + b = c$
$\equiv$	Is identically equal to; congruent; equal to by definition $(a - b) \equiv (c - d)$
$\neq$	Is not equal to; is not identical with $x \neq x_o$
$>$	Is greater than $6 > 4$
$<$	Is less than $4 < 6$
$\geqq$ or $\geq$ (or $\geqslant$)	Equal to or greater than $a \geqq b$; or $a \geqslant b$
$\leqq$ or $\leq$ (or $\leqslant$)	Equal to or less than $b \leqq a$; or $b \leqslant a$
$'$	Prime Minutes (angle) a' a prime $21'$ 21 minutes
$''$	Double prime Seconds (angle) a'' a double prime $22''$ 22 seconds
$\rightarrow$	Tends to; approaches the limit of $x \rightarrow 6$
$\approx$	Nearly equal to $x \approx 6$
:	The ratio of; is to; used to indicate geometrical proportion. Do not substitute the diagonal for this sign. 10:2 = 20:4 (not 10/2 = 10/4)

$=$ Proportion; as

$$10:2 = 20:4 \quad \text{(Ten is to 2 as 20 is to 4)}$$

$+$ Plus

$$b + c$$

$-$ Minus

$$b - a$$

$\pm$ Plus or minus

$$212 \pm 2$$

$\cdot\,\cdot$ Multiplied by. This sign is centered above the line.

$$5 \cdot 4 \cdot 5 = 100$$

$\propto$ Varies directly as; is directly in proportion to

$$a \propto b$$

∞ Infinity

$\therefore$ Therefore

$$a = b$$

$$b = c$$

$$\therefore a = c$$

$\because$ Since, because

$$\because a = b, \text{ and}$$
$$b = c$$
$$\therefore a = c$$

$\int$ Integral. (This sign varies according to the size of the equation that it embraces.)

$$\int 2x\,dx = x^2$$

$\int_a^b$ Integral with limits

$$\int_a^b A(x)\,dx$$

$\sqrt{}$ Square root. The length of this sign varies.

$$\sqrt{38412} \cdot 21 \quad \text{or} \quad \sqrt{3}$$

$\sqrt[3]{}$ Cube root. Other numbers expressing the degree of the required root may be used; for example: $\sqrt[5]{}$ (fifth root), $\sqrt[10]{}$ (tenth root), etc.

9.4.2 Chemical Signs.

→ Yields; forms. Indicates a chemical reaction and the production of a new compound.

$$2H_2 + O_2 \rightarrow 2H_2O$$

⇋ Forms and is formed from (indicating that the reaction is reversible)

$$NaNO_3 + NH_4Cl \leftrightharpoons NaCl + NH_4NO_3 \rightarrow 2H_2O + N_2$$

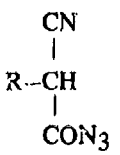
↓ Indicates that a particular substance is released as a precipitate when a reaction occurs

$$AgNO_3 + HCl \rightarrow AgCl\downarrow + HNO_3$$

↑ Indicates that a particular substance is released as a gas when a reaction occurs

$$Mg_3N_2 + 6H_2O \rightarrow 3Mg(OH)_2 + 2NH_3\uparrow$$

— Bond, or unit of attractive force. Used between symbols of elements that unite to form a compound. (These signs must be of equal length within a formula and no shorter than 1/8 inch.)



= Double bond

$H_2C{=}CH_2$

≡ Triple bond

$HC{\equiv}CH$

Benzene ring

Saturated bei. ..ne ring

10. FOOTNOTES

10.1 Symbols. Footnote reference symbols used in the report, except those keyed to tables and specific items in an illustration, will be the asterisk (*), double asterisk (**), dagger (†), section mark (§), and double section mark (§§). The symbols will appear in the order shown here. Symbols in the text will be placed directly after the words or phrases to which the footnotes refer.

10.2 Placement. The footnote must always be placed at the bottom of the same page carrying the reference symbol. A 2-inch line will be drawn from the left margin, thus separating the last sentence and the footnote; for example:

Xxxx xxxx xxxxxxx xxx xxxxxxxxxxx xxx xxxxx xxxxxx xxx xxxxxx.

---

*Xxxxx xxxxxxxxx xxx xxxx xxxxxxxxx xxx xxxxxx xxx xxxxxxxx xxxx xxx xxxxx xxxxxxxx xx xxx xxxxxxxx.

**Xxxx xxxxxx xxx xxxx xx xxx xx xxxxxxxxxx xx xxxxxx xxxxxxx xxxx xx xxx xxxxx.

10.3 Footnotes Used With Tables. When fewer than three items appear in a table, the single and double asterisks will be used. The symbol and footnote will be placed directly beneath the table; use the same format as described for text footnotes.

10.4 Multiple Footnotes With Tables. The lower-case alphabet in superscript (16^{a}, 19^{b}) will be used for the table when there are more than two symbols requiring definitions. The symbols will appear in alphabetical sequence and will be read from left to right and from top to bottom. The symbols and footnotes will also be placed at the bottom of the table. A new alphabetical sequence is begun when these designations are required in subsequent tables. If a page that follows contains an item previously defined, the item will again be defined in a footnote as before.

10.5 Symbols Keyed to Illustrations. Any type of symbol or coined abbreviation keyed to an illustration may be used. These expressions and their definitions will be placed under the figure caption and they will be listed in logical order.

11. PROOFREADER'S MARKS

⊙	Insert period.
^	Insert indicated material.
ℓ or /	Delete single character.
ℓ or I	Take out a letter and close up.
e	Delete word
e	Delete sentence or paragraph.
⁀	Close up.
⁀	Hyphen at end of line. If hyphenated word falls on next line, write word solid.
-⁀	Hyphen at end of line. If hyphenated word falls on next line, leave hyphen in.
#	Space.
¶	Paragraph.
no ¶	No paragraph.
¶	No paragraph, run in.
SP	Spell out
	Transpose.
3 1 2	Transpose.
	Move to indicated spot.
/	Lower case, single letter.
	Lower case, word.
≡	Upper case, single letter.
	Upper case, word.
	Underscore.
	Move to left.
5	Move to left 5 spaces.
	Move to right
5	Move to right 5 spaces.
	Move up.
	Move down.
stet	Let it stand. Do not delete.

12. WORD LIST

This list contains special technical and nontechnical words written in the preferred form. At the end of the word list is a ready reference to various rules concerning capitalization, hyphened adjectives, prefixes, and the use of the comma and the colon.

A

accelerated-aging (adj)
acetylene black
acid- and organic-vapor (adj)
acknowledgment(s)
addendum (plural, addenda)
air-arming (adj)
airblast
airborne
airburst
air-cool (v)
air-cooled (adj)
air-dried (adj)
air-dry (adj, v)
air-drying (n)
airflow
airfoil
air line (line for air)
airline (aviation)
air lock (n)
air-lock (v)
air-pressurized (adj)
air-service (adj)
airspeed
airtight
all (not followed by of except with pronouns, as all of it, all of which, and all of them)
all-ways (fuze)
alternating-current (adj)
alternating current (n)
analog
angletube
appendix(es)
arming-wire (adj)
armor-piercing (adj)
axial-flow (adj)

B

back angle
Bakelite (n)
bakelite (adj)
ballistite
base-down (adj)
base-ejection (adj)
baseplate
Berl saddles
bioassay
blowby
blowcase
blowoff
blowout
blown-out (adj)
blowtorch
bomb bay (adj, n)
bomb-filling (adj)
bouchon
Brabender 100 (plasticity)
brazed-in (adj)
breakaway
breakdown
breakpoint
breakthrough(s) (n)
break time (n)
breakup
bridgehead
broadband
building E3330
buildup (n, adj)
buna N, buna S
buna rubber
burette
burning-type (adj)
burnoff
burster tube (n, as adj use hyphen)
butyl rubber
bypass
byproduct

C

canceled (canceling)
cancellation
cannon (sing. and pl.)
Cannon plugs

capacity (usually redundant when used adjectively with unit of measure):
a 50-gal tank rather than
a 50-gal-capacity tank
carbitol
cast iron (n, as adj use hyphen)
catalog
centerline
checkup (n)
chemical-filled (adj)
chipboard
chloroprene
cleanup
clear-cut (adj)
closeup
coagent
cold-chamber (adj)
cold-weather (adj)
colored-smoke (adj)
colored-smoke-trail (adj)
compare to (because of a real or imagined similarity)
compare with (when two are set side by side in order to show their relative merits, or to bring out their characteristic qualities)
compendium(s)
consist in (used in defining the nature of a thing especially when immaterial or abstract or designating that in which it is comprised or on which it depends)
consist of (used in indicating the parts or material of which a thing is composed)
constant-boiling (adj except pred)
constant boiling (pred adj)
constant-flow (adj)
constant-level (adj)
cooperate
coordinate
cotton-duck (adj)
counteraction
countercurrent
cross section
cross-sectional (adj)
crosswind
cup-filter (adj)
cutoff
cutout

D

dark-field (adj)
datum (pural, data)
de-ionization
delay-and-superquick (adj)
delay-arming (adj except pred)
delay arming (pred adj)
designated (but standardized as)
dewpoint
diacid
diameter (usually redundant when used adjectively with unit of measure):
a 3-in. pipe (understood to mean ID)
rather than
a 3-in.-diam. pipe or a 3-in.- ID pipe
but
a 3-in.-OD pipe
dimethyl hydrogen phosphite
disk
disoap
downwind
drawback (n)
drawcord
drop test (n, as adj and v use hyphen)
drying oil (n, as adj use hyphen)
du Pont
Duponol 80
Duprene
Duralon

E

end plate
end point (n)
end product
Engineer's Special blasting cap
equimolar
ethyl cellulose
exhaust-steam (adj)
explosive D
expulsion-type (adj)
eyebolt
eyehole
eyelens
eyepiece
eye-ring
eyeshield

F

faceblank
faceform
facepiece
fallout
fast-burning
fatty acid (adj, n)
feed plate (n)
feed rate (n)
fiberglass (or Fiberglas as trade name)
field test (n; as adj and v use hyphen)
figure (see nine and ten, below)
-filled (adj)
filter cake
firepower
fireproof
fire-starter (adj)
fire-tested (adj)
first aid
firsthand
flowmeter
flow rate (n)
flowsheet
foamed polystyrene
foot-candle
formula(s)
framework
full-molded (but fully molded)
full-vision (adj)
fuze (powder train)

G

gage
gas black
gasproof
gas-resistant
gastight
gel-forming (adj)
glass-lined (adj)
glide bomb (n, as adj and v use hyphen)
"go, no-go" (adj)
goop
ground burst (n; as adj and v use hyphen)
guided missile (n)
guided-missile (adj)

H

half life
half speed
halfway
hand-drawn (adj)
handhole
handmade
handwheel
head form
head harness
headpad
headphone
headset
head-wound (adj)
heat-sealing (adj)
heavy–laden (adj)
heavily laden
heavyweight
helix (helixes)
hemicylindrical
herringbone twill (adj, n) (may be abbreviated to hbt in tables only; should be defined where first used)
high-flask (adj)
high-test (adj)
homolog
hose clamp
hose tube
hundredfold
H-vapor (adj)

I

ice bath
ignitibility
impregnite I
inasmuch as
inches
    3 in. (read three inches)
    3-in. pipe (read three-inch pipe; see also diameter, above)
    3 to 4 in.
    12 by 10 by 8 in.
    12 by 10 by 8-in. box
    6-, 8-, and 10-in. pipes
Indalone
index(es)
infrared
inlet valve
in situ
insofar as
iso-octane
iso-Systox

in vitro
in vivo

J

judgment

K

knife edge
kraft paper

L

lacrimal (adj)
lacrimate (v)
lacrimation (n)
lacrimatory (adj)
lampblack
large-area (adj)
large-capacity (adj)
large-scale (adj)
large-size (adj)
large-type (adj)
layout (adj, n)
left-handed(ed)
let-go(es) (n)
Levinstein
lifespan
light-colored
lightweight (adj, n) (except as in "The light weight was the chief factor.")
like (suffix forming solid word, but bell-like to avoid tripling a consonant)
liquid-H (adj)
live-steam (adj)
lockseam (n, as v use hyphen)
long-range (adj)
louver
low-resistance (adj)
low-vapor-pressure (adj)
L-shaped

M

main-armament (adj)
Manila paper
matrix(es)
mediumweight (n, adj)
memorandum(s)
60-mesh (adj)
10- and (or) 20-mesh (adj)
60-mesh (adj)
10- and (or) 20-mesh (adj)
10- to 20-mesh (adj)
10 and (or, to) 20 mesh (n)
10-20 mesh (in tables)
metal-organic (not metallo) compounds
metal-to-metal (adj)
micro [prefix without hyphen; a millionth of a (specified) unit]
midpoint
midway
mildewproof
mockup
moistureproof
mold
Monel
monoacid
monosoap
motor-driven (adj)
mouthpiece
multilayer
mustard-filled (adj)
mustardproof
mustard-resistant (adj)

N

naphtha
narrow-necked (but three-neck) (adj)
neat's-foot
neoprene
nine and under (spell out except with units of quantity, measurement, and time or in groups of two or more numbers any one of which is ten or more)
non (one word except when word to which it is prefixed begins with a capital letter or is a hyphened compound)
none (when singular or plural verb equally well expresses the sense, plural is preferred)
nose clip
nose-ejection-type (adj)
nosepiece
number:
a number of canisters were . . .
the number of canisters was . . .
(when used collectively)
nylon

O

octal
offset
oil bath (n)
oil-bath (adj)
oil-bearing
one-half
Operation HARDTACK, but Shot Quince
optimum-size (adj)
organo (prefix without hyphen)
O-ring
outlet valve (adj, n)
overall
overfilling (n)
overnight

P

particle-size (adj)
parts (use figures, as 3 parts of acid)
payload
percent [5% to (or, and) 10%]
percentage
permeable-type (adj)
photoelectric
phototube
pickup
pillbox
pilot plant (n, as adj use hyphen)
pitot tube
pipette
plaster of Paris
Plexiglas
Pliofilm
plughole
Poisson's ratio
post mortem (adj, n, v)
postwar; prewar
practice (n, v)
primacord
projectile(s)
proof (suffix without hyphen)
proof test (n, as adj use hyphen)
prooftest (v)
propellant (n)
propellent (adj)
pulsejet
PWP-filled (or plasticized-WP- filled) (adj)
Pyrex

Q

quick match

R

radius (pl radii)
ramjet
range-extension
re-coil (to coil again)
re-cover (to cover again)
redistillation
re-form (to form again)
rerun
resume (to begin again)
resumé (a summary)
re-treat (to treat again)
re-use (to use again)
right-angle (adj, v)
ring-and-ball (adj)
rings (not bundles) of propellant
rough-handle (v)
rough-handled (adj)
rough-handling
round-bottom flask
runoff (adj, n)
run off (v)

S

screw-fit (adj)
screwhead
screw-on (adj)
semi (see rule on prefixes below)
series:
    a series of tests was . . .
    three series of tests were . . .
service test (n, as adj and v use hyphen)
sesquiglycol
sesqui-H
sesquimustard
sesquioxide
setback
setup
shear-wire (adj)
sheet iron (n, as adj use hyphen)
shell (sing. and pl)
shellburst
shock wave
shock-mounted (v, adj)
shutdown

side storage (n, as adj use hyphen)
signaling
slow-burning (adj)
small- (see large-, above)
smoke-generating (adj)
smokepuff
smokescreen
smoketrail
smoke-tracking (adj)
smoothbore
so-called (adj)
spaceband
spectrum (s)
split-nut (adj)
spotting-charge (adj)
spotweld
spot-welded (adj)
standard-size (adj)
standardized as (but designated)
standby (adj, n)
steam bath
steam-distilled (adj, pred adj)
steam heat
steam-heated (adj)
stopcock
sulfonate
sulfur
sun-checked (adj)
super (prefix without hyphen)
supersede
sweptback
symposium(s)

T

table 3
tail cup
tail end
tail-fin (adj)
tailpiece
tail pipe
tail-well (adj)
take-off (n)
teardrop
Technicon AutoAnalyzer
temperature-controlled (adj)
ten and over (use figure except at beginning of a sentence
terneplate
test 5
top plate
tetraacetate
tetralol
therm-64C, therm-8-2
thermit
Thiokol
thio-Michler's ketone
three-neck (adj)
through
through-flow (adj)
tie rod
time-and-superquick (adj)
time-delay (adj)
tinplate
tin-plated (adj)
tin-plating (adj)
torus (pl tori)
torus-shaped (adj)
toward
trisoap
T-shaped
T-tube
turbojet
two-compartment (adj)
twofold
Tygon
-type (adj) (but hyphen omitted as in V-2 type)

U

ultra-atomic (adj)
ultra-high-speed (adj)
ultraviolet (adj, n)
under (prefix without hyphen)
under way
unfilled (empty) shell
unfulfilled (not unfilled) requirement
updraft
up-to-date (adj, otherwise without hyphens)
upwind
uranium 235
U-shaped
U-tube

V

vaporproof
vaportight
vent-air drying
venturi
versus (abbreviate to vs in tables only)

vincennite
vinylite
vinyon
void-controlling (adj)
volumes (use figures, as 6 volumes of liquid)

W

warhead
water bath (as adj use hyphen)
waterproof
waterproofed
watertight
water-washed (adj)
water-white (adj)
waveguide
wavelength
waxlike (adj)
weekend
well-known
whetlerite
wing-mounted (adj)
worth-while (adj, except pred, n)
worthwhile (pred adj)
writeup (n)
WP-filled (adj)

X

X-ray

Y

Y-tube

Z

zinc-coated (adj)

13. CAPITALIZATION

13.1 A common noun used with a date, number, or letter does not form a proper name and is not capitalized unless accompanied by a title.

13 2 Examples:

abstract B
act of 1956
appendix C
appendixes A and B
class I
column 2
drawing BX11-2-8
exhibit D
figure 7
figures 8 and 9
page 2
pages 23 and 24
schedule I
section I
sections II and III
table 4
tables 2 and 3
twentieth century
volume X
volumes XI and XII

14. HYPHENED ADJECTIVES

Words combined to form a unit modifier immediately preceding the word or words modified are hyphened unless the first word is an adverb ending in "ly" or the first word of a three-word modifier is an adverb and modifies the second (names of chemical compounds are not hyphened when used as modifiers; e.g., sodium chloride solutions). Examples:

constant-level method
Fire-tested material
heavy-laden ship; but heavily laden ship
high-nitrogen-content cellulose
nose-ejection-type shell
oil-bearing shale
well-defined curve; but very well defined curve

15. PREFIXES

15.1 The prefix "anti" or "semi" requires a hyphen when the word to which it is prefixed (1) begins with the letter "i," (2) begins with a capital letter, (3) is a hyphened compound, or (4) when prefixed to a two-word form which, consequently, must be made a hyphened compound. Examples:

anti-intellectual; semi-insoluble
anti-American; semi-Gothic
anti-hog-cholera serum; semi-armor-piercing shell

15.2 The prefix "non" requires a hyphen only when the word to which it is prefixed (1) begins with a capital letter or (2) is a hyphened compound. Examples:

non-Anglican
non-heat-sealing compound

16. USE OF THE COMMA

A few of the rules governing the use of the comma are shown below. The comma is used:

(a) To indicate the omission of a word or words.

Example: Part of the clothing was laundered; the remainder, impregnated.

(b) Between an introductory modifying phrase and the subject modified.

Example: After being reconditioned, they were fired statically.

(c) To set off parenthetical words, phrases, or clauses.

Examples: It is unnecessary, however, to conduct further tests. Twenty shell, with new base assemblies, were fired.

but

The 20 shell with new base assemblies (restrictive phrase) functioned satisfactorily.

or

A shell, slightly overfilled, was placed in surveillance.

(d) After each member within a series of three or more words, phrases, clauses, letters, or figures used with and or or.

Examples: Shell, bombs, and rockets were fired.
There were four men, three women, and six children present (but 4 men, 3 women, and 12 children).
The clothing was laundered, reimpregnated, and shipped.

Tests were conducted at -65°F, at room temperature, and under simulated tropical conditions.
All necessary equipment was assembled, installation was started, and the plant will be in operation in 3 weeks.
Move paragraphs a, b, and c to page 2.

(e) Before the conjunction in a compound sentence if the second clause is complete with subject and predicate.

Example: Equipment was installed, and the pilot plant is now ready for operation.

but

Equipment was assembled and is being installed in the pilot plant.

17. USE OF THE COLON

17.1 The principal use of the colon in technical reports is to introduce formally any matter that follows. Introductory statements such as the following are suitable:

Examples: The results were as follows:
The following results were obtained:
The results have been tabulated, as follows:

17.2 The matter referred to in any such statement must follow the colon immediately. (A statement such as, "The results are described below" is used when the matter referred to does not follow immediately. One or more sentences, paragraphs, or pages may intervene.)

17.3 Examples of the presentation, in paragraph form, of matter following a colon are shown below. The manner of presentation and punctuation depends upon the complexity.

Examples: The principal reasons for malfunctioning of the shell were as follows:
(1) The - - - (clause), (2) the - - - (words, phrases, or clause), and (3) the - - - (words, phrases, or clause).

18. NUMERALS AND ORDINALS

18.1 Figures are used for a single number of 10 or more unless the number is the first word of the sentence:

Examples: nearly 10 kilometers
Ten kilometers were traveled.

18.2 A unit of measurement, time, or money is expressed in figures when used within the sentence:

Example: This requires from two to eight washes and a total time of 2 to 4 hours.

18.3 Figures are used for serial numbers:

Examples: Bulletin 725
pages 3 and 4
the end of chapter 2

18.4 Units of measurement and time, as unit modifiers, are expressed in figures:

Examples: 5-day week
10-foot pole
1/2-inch pipe
5-percent increase

18.5 Ordinals and numbers appearing in a sentence are treated according to the rules dealing with numerals:

Examples: The fourth group contained three items.
The 10th group contained 12 items.
The first group contained one 6-inch item.

18.6 Numerals are spelled out at the beginning of a sentence:

Examples: Five years ago . . .
Five hundred and fifty years ago . . .

18.7 Numbers of less than 100 preceding a compound modifier containing a figure are spelled out:

Examples: two 3/4-inch boards
twelve 6-inch guns
but
120 6-inch boards
three four-room houses

18.8 Except as in paragraphs 18.4 and 18.6, a whole number less than 11 is spelled out:

Examples: . . . six of the buildings.
but
. . . 6½ years ago.

18.9 Related numbers appearing at the beginning of a sentence, separated by no more than three words, are treated alike:

Example: Fifty or sixty miles away is . . .

18.10 Fractions standing alone, or if followed by "of a" or "of an", are spelled out:

Examples: three-fourths of an inch
three-quarters of an inch
one-half inch
half an inch
one-tenth
two one-hundredths
but
1/2-inch pipe
1/4-inch-diameter pipe
3½ cans
2½ times

19. JARGON

An author of a book on writing and editing defines jargon as "the name given to the technical or secret vocabulary of a science, art, trade, sect, profession, or other special group". This verbal shorthand is useful among the special groups of people who develop it because it simplifies daily communication. It can usually mystify readers, however, when it creeps into a report for wide distribution. The rule is: If jargon is necessary, define it at first use.

20. TRADE NAMES

Trade names (such as Carborundum, Carbowax, and Fibergias) are copyrighted property and are capitalized in CSL reports to indicate that status. When trade names are cited in a report, the Preface will include the required administrative disclaimer (figure 3, CSL SOP 70-5).

APPENDIX A

FIGURES

AD

CHEMICAL SYSTEMS LABORATORY TECHNICAL REPORT

ARCSL-TR-79041

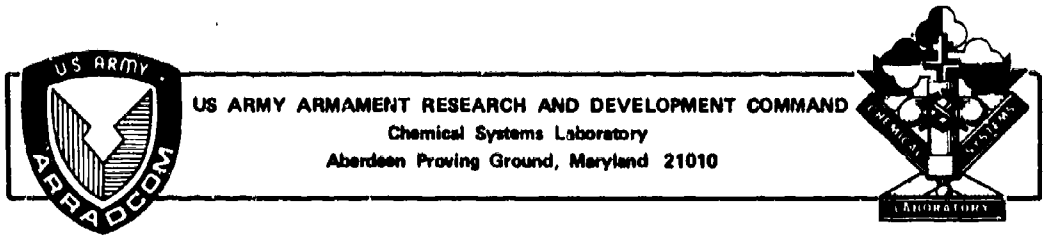
SUMMARY OF M60A1 TANK LEAKAGE TESTING

by

John M. Ferriter
Leonard J. Beeson

Physical Protection Division

June 1979



Approved for public release; distribution unlimited.

Figure A-1. Sample Front Cover – Technical Report

(CLASSIFICATION DESIGNATION)

AD

CHEMICAL SYSTEMS LABORATORY TECHNICAL REPORT

ARCSL-TR-XXXX

XXXXXXXXXXX XXXXX (TITLE) XXXXXXX XXXXXXXXXXX (U)

by

Carlton P. Williams

Research Division

November 1979

NATIONAL SECURITY INFORMATION
Unauthorized Disclosure
Subject to Criminal Sanctions

Classified by: XXXXXXXX XX XXXX
Review on: XXXXX XX XXXX

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND
Chemical Systems Laboratory
Aberdeen Proving Ground, Maryland 21010

(CLASSIFICATION DESIGNATION)

Figure A-2. Sample Front Cover – Classified Technical Report

AD

CHEMICAL SYSTEMS LABORATORY CONTRACTOR REPORT

ARCSL-CR-80XXX

BUTYL OVERLAY ON FIBER

by

J. Thomas Smith

December 1979

TRI-STATE DYNAMICS, INC.
Engineering and Science Laboratory
Lebanon, Pennsylvania 17042

Contract No. XXXX-XX-X-XXXX

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND
Chemical Systems Laboratory
Aberdeen Proving Ground, Maryland 21010

Approved for public release; distribution unlimited.

Figure A-3. Sample Front Cover – Contractor Report

CHEMICAL SYSTEMS LABORATORY TECHNICAL MEMORANDUM

ARCSL-TM-79012

A MATHEMATICAL MODEL FOR NON-UNIFORM SIMPLE SURFACE EVAPORATION OF A LIQUID CONTAMINANT (NUSSE)

by

SFC Richard V. Leggett

Systems Analysis Branch
Systems Development Division

July 1979

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND
Chemical Systems Laboratory
Aberdeen Proving Ground, Maryland 21010

Each transmittal outside ARRADCOM Chemical Systems Laboratory must have prior approval of the Deputy Director. See additional information and distribution controls in the PREFACE.

Figure A-4. Sample Front Cover -- Technical Memorandum

AD

CHEMICAL SYSTEMS LABORATORY TECHNICAL REPORT

ARCSL-TR-79032

PATTERN RECOGNITION APPLICATIONS IN CHEMISTRY AND PHARMACOLOGY. V. HALCAP-HIERARCHICAL AVERAGE LINKAGE CLUSTER ANALYSIS PROGRAM

by

William D. Thornton
Paul H. Broome
William P. Ashman

Research Division

1. This information is accepted for defense purposes only.
2. This information shall not be disclosed to another country without the consent of the United States.
3. This information is accepted solely for the purpose of information and shall accordingly be treated as disclosed in confidence. The recipient government shall use its best endeavors to ensure that the information is not dealt with in any manner likely to prejudice the right to obtain patent or other statutory protection thereof.
4. The recipient government shall obtain the consent of the United States if it desires that the information be made available for manufacture, or use, for defense purposes.

June 1979

US ARMY ARMAMENT RESEARCH AND DEVELOPMENT COMMAND
Chemical Systems Laboratory
Aberdeen Proving Ground, Maryland 21010

Distribution limited to US Government agencies only because of test and evaluation; June 1979. Other requests for this document must be referred to Commander/Director, Chemical Systems Laboratory, ATTN: DRDAR-CLJ-R, Aberdeen Proving Ground, Maryland 21010.

Figure A-5. Sample Front Cover With TTCP-Approved Statement

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ARCSL-TR-78012	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) RAPID DETECTION OF BOUND AND FREE ENDOTOXIN USING THE LIMULUS ASSAY		5. TYPE OF REPORT & PERIOD COVERED Technical Report July 1974–September 1975 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) William H. Kraybill, Michael Shepel, Henry R. Tribble, Stanford A. Mumford, Abe Pital, Ira M. Abelow		8. CONTRACT OR GRANT NUMBER(s) Task 1L762711AD3402
9. PERFORMING ORGANIZATION NAME AND ADDRESS Commander/Director, Chemical Systems Laboratory ATTN; DRDAR-CLL-MC Aberdeen Proving Ground, Maryland 21010		10. PROGRAM ELEMENT PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Commander/Director, Chemical Systems Laboratory ATTN: DRDAR-CLJ-R Aberdeen Proving Ground, Maryland 21010		12. REPORT DATE January 1978 13. NUMBER OF PAGES 23
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE NA

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Group specific detection
Biological All-clear Kit
Presented at the American Society for Microbiologist Annual Meeting at New Orleans, 12 May 1977.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Rapid detection	Limulus assay
Endotoxin	Spectrophotometric method
Lipopolysaccharide	Alternating Colorimeter
Pyrogen	Increased temperature

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

In efforts to decrease the time required for detection of endotoxin from various bacterial products, the limulus lysate was reacted with dried bacteria, cell-free filtrate, or whole broth culture at 26°C, 37°C, and 51°C. The resulting gelation was observed visually in a test tube or was recorded using colorimetric or spectrophotometric methods. A four-centimeter path length liquid colorimeter was used to measure early gel formation by alternately comparing absorption

(Continued on reverse side)

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Figure A-6. Sample Report Documentation Page – Inhouse Report

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ARCSL-CR-80XXX	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) STUDY OF SILICONE-TO-ALUMINUM BONDING AND SILICONE ELASTOMER MODIFICATION		5. TYPE OF REPORT & PERIOD COVERED Final Report March 1978-August 1979 6. PERFORMING ORG. REPORT NUMBER PES 7901
7. AUTHOR(s) Harvey J. Stewart Paul T. Johnson		8. CONTRACT OR GRANT NUMBER(s) DAAA15-78-C-XXXX
9. PERFORMING ORGANIZATION NAME AND ADDRESS Palmer Engineering Services, Inc. Burning Bush, Ohio 29023		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Commander/Director, Chemical Systems Laboratory ATTN: DRDAR-CLJ-R Aberdeen Proving Ground, Maryland 21010		12. REPORT DATE September 1979 13. NUMBER OF PAGES 42
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office) Commander/Director, Chemical Systems Laboratory ATTN: DRDAR-XXX-X Aberdeen Proving Ground, Maryland 21010		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE NA
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES Contract Project Officer: Patrick A. Kelly (DRDAR-XXX-X, 671-XXXX).		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Protective mask Penetration Silicone rubber Bonding		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Additional cross-linking of xxxxxxxx xxxxx xxx xx xxxxxxxx xxxx xx xxxxxxx xxxxxxx xxxx xx xxxx xxxxx xxxxxxxx xxxx xx xxxxxxxx xxxxx. Xxxxx xxxxxxx xxxx xxxxxx xxx xxxxxx		

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Figure A-7. Sample Report Documentation Page -- Contractor Report

CONTENTS

NOTE: Generally, the decimal system used in this guide will be used in all reports.

Figure A-8. Sample Table of Contents

LITERATURE CITED

1. Crabtree, E. V., and Poziomek, E. J. Edgewood Arsenal Technical Report EATR 4054. Colorimetric Detection of Volatile Alkyl Isocyanides. November 1966. UNCLASSIFIED Report.

2. Durig, James R., Block, Frank, and Levin, I. W. Chemical Research and Development Laboratories Special Publication 3-23. Vibrational Spectra of CH_3PCl_2, and CH_3PSCl_2. December 1965. UNCLASSIFIED Report.

3. Smith, James. Louisiana State University. First Annual Report. Contract DA-18-108-CML-3786. Spot Tests for Compounds. June 1953. UNCLASSIFIED Report.

4. Crawford, B. L., Jr., and Horwitz, W. A Raman Apparatus for Quantitative Polarization Measurements. J. Chem. Phys. *15*, 268 (1947).

5. Bellamy, L. J. The Infrared Spectra of Complex Molecules, p 312. John Wiley and Sons, Inc., New York, New York. 1957.

6. Feigl, F. Spot Tests. 4th Ed. Vol I. pp 210-212. Elsevier Publishing Company, New York, New York. 1954.

7. Military Specification. MIL-P-51181(Mu). Detector Paper. US Government Printing Office. March 1966.

8. Kramer, D. N., Morin. R. D., and Poirier, R. H. US Patent 2,926,072. 23 February 1960.

9. Merrill, James. University of South Carolina. Paper presented at the American Chemical Society meeting, Baltimore, Maryland. April 1966.

Figure A-9. Sample Literature Cited and Selected References

(1) Technical Report, (2) Special Publication, (3) Contractor Report, (4) Journal Article, (5, 6) Books, (7) Military Specification, (8) Patent, and (9) Paper.

GLOSSARY

ChE	Cholinesterase
Chromel	Nickel-chromium alloy
CN	Chloroacetophenone
dural	Duralumin aircraft structural plate, a high-strength aluminum alloy
HE	High explosive
NMR	Nuclear magnetic resonance
Plexiglas	Acrylic resin or plastic
therm-64C	Incendiary filling for bombs and grenades
Teflon	Tetrafluoroethylene resins
thiokol LP2	Organic liquid polysulfide polymer (synthetic rubber)
U^{233}	Uranium 233
WP	White phosphorus

Figure A-10. Sample Glossary – Words and Abbreviations

GLOSSARY

σ	stress
ϵ	true strain = $\ln(1 + \epsilon_o)$
ϵ_o	engineering strain
E	modulus of elasticity
η	viscous parameter
δ	plastic modulus
ρ	density
A	shear area
I	moment of inertia
b	thickness
r	radius
ν	Poisson's ratio
ϕ	dynamic shear modulus = $\frac{\phi_E}{2(1+\nu)}$
ϕ_ϵ	dynamic tensile modulus
w	displacement
t	time
Λ	half wave length = $v_o t$
v_o	impact velocity
a_p	peak acceleration

Figure A-11. Sample Glossary -- Greek and English Letters

x	radial component of flat plate
y	circumferential component of flat plate
c_o	initial stress wave propagation velocity = $\left(\frac{\phi}{\rho}\right)^{1/2}$
K_o	radius of gyration = $\left(\frac{I}{A}\right)^{1/2}$
α	wave number
P	pressure
p	angular frequency
C_o	mass X peak acceleration
m	mass
Ω	factor equal to $(1 + \nu/2\pi)$
D	amplitude of transverse pulse
c_g	group velocity

APPENDIX A

TABLES

Table A-1. Title

17

Table A-2. Title

Figure A-12. Format for First and Succeeding Pages of an Appendix

APPENDIXES

Figure A-13. Sample Appendix Section Title Page

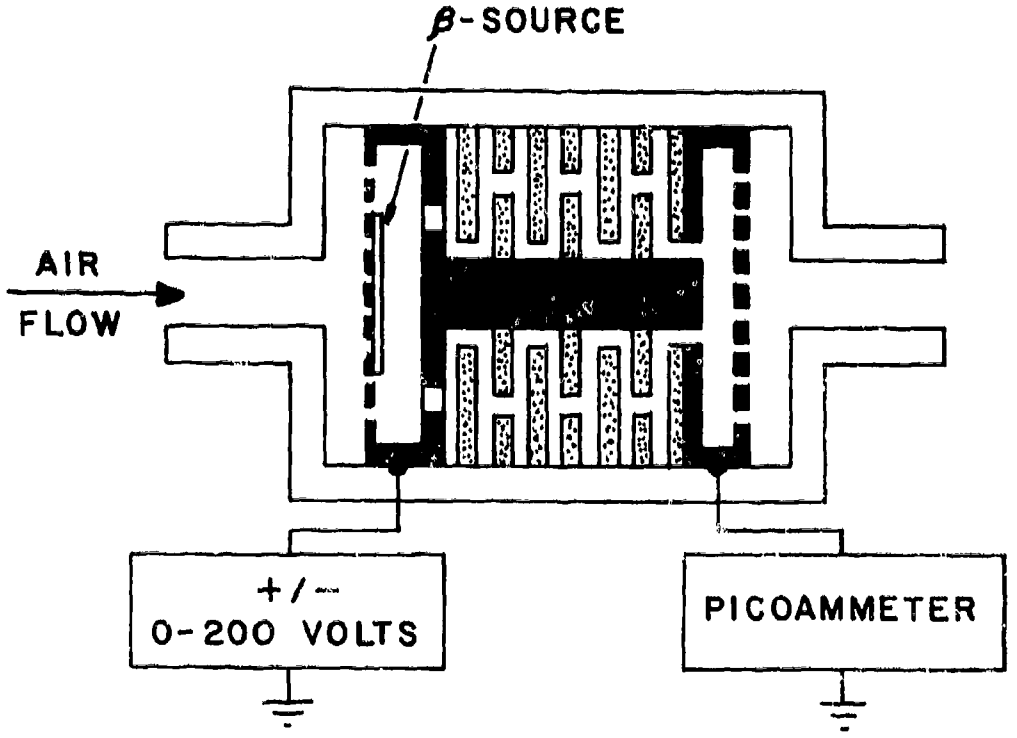


Figure 2. Schematic Diagram of an IDS Cell

Figure A-14. Sample Line Drawing

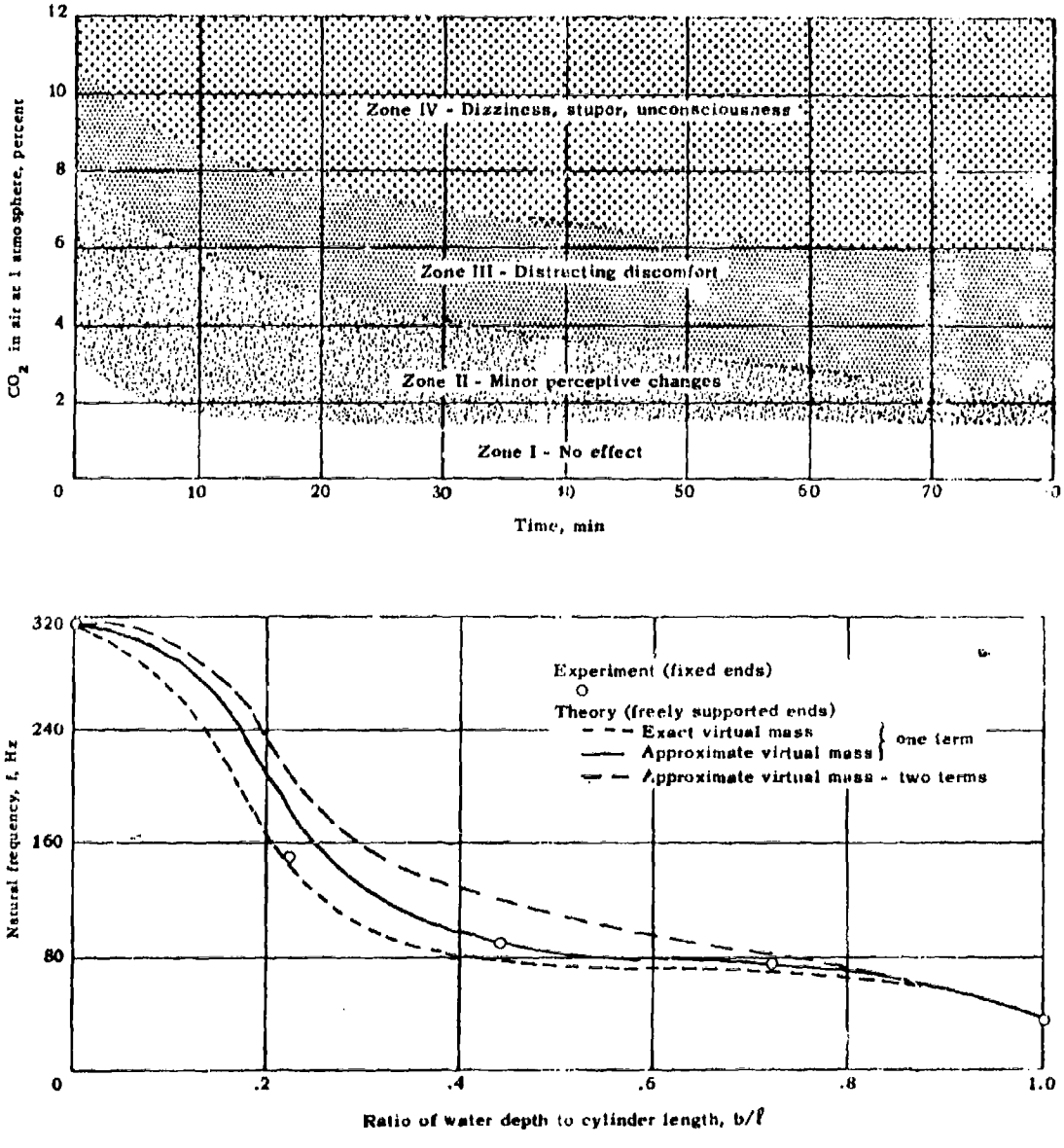


Figure A-15. Sample Graphs: Screening (Top) and Coding (Bottom) Used as Substitutes for Color

3.1 Application

With the encouraging results gained from test specimens, the process was applied to brazing actual hardware. Water was eliminated as a quenching medium because of its incompatibility with various reagents; an inert gas was substituted in order to achieve a T-4 condition in the base metal after brazing.

The first series of tests of time versus temperature was conducted using helium, argon, and liquid nitrogen. The test results showed helium to be the best. It was possible to lower the temperatures of the furnace and the part from the braze temperatures much more rapidly with helium than with any other gas. The dew point of helium and argon in all tests was -76°F minimum. All brazed and quenched bomblet canisters met the leak-rate criterion of 1×10^{-6} cc/sec for 15 sec (figure 2).

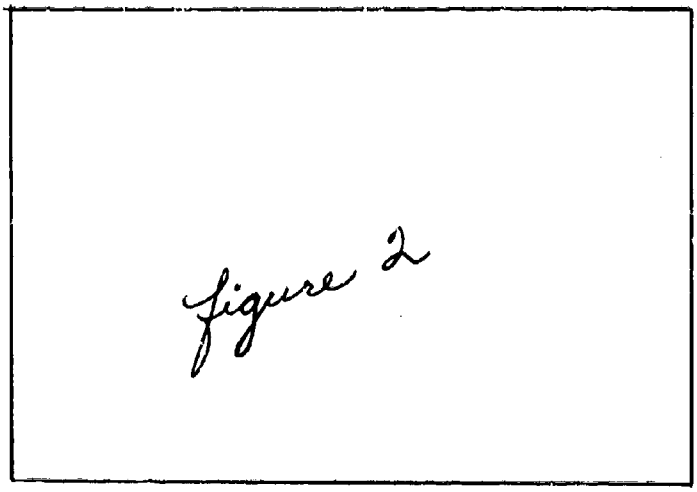


Figure 2. Vacuum-Brazed, Gas-Quenched Bomblet Canister

The brazing clearance used was an 0.002-in.-interference fit. The maximum joint clearance was not determined.

The braze and heat-treat cycle consisted of:

(a) Heat to 980°F and hold 30 min.

(b) Raise temperature to 1,080°F and hold 30 sec.

(c) Introduce helium and cool.

Figure A-16. Figure Reduced to Fit on Page With Text

Table B. Mean Gelation Time of Limulus Amoebocyte Lysate (LAL) with Whole Broth, Dry Cells, and Spent Broth from Six Bacteria at Two Incubation Temperatures

Concentration (cells/ml)		10^9	10^8	10^7	10^6	10^5	10^4	10^3	Average mean 10^{4-9}
Biological product	Temperature	Mean time							
	°C	min							
Whole broth*	37	30.0	32.5	36.0	36.0	42.0	53.3	57.5	38.3
	51	11.7	10.7	14.1	22.5	30.8	48.3	30**	23.0
Dry cells	37	26.3	27.5	32.0	37.5	45.0	60.0**	60**	38.1
	51	12.5	15.0	15.0	15.0	30.0	45.0	No clot	22.1
Spent broth	37	30.0	30.0	30.0	30.0	40.0	60.0**	No Clot**	36.7
	51	15.0	15.0	18.0		15.0	60.0	No clot	24.3

* *Pseudomonas aeruginosa*, 1.13×10^5 bacteria/ml
37°C – Six replicates = 30.0 mean, zero standard deviation, zero coefficient of variation.
51°C – Ten replicates = 25.5 mean, 7.2 standard deviation, 0.28 coefficient of variation.

** Single observation.

Figure A-17. Sample Table

EQUATIONS

One-Line Equation:

$$\sqrt{\Phi} = \sum_{k=0}^{m} \epsilon_k (A_k \cos k\psi + B_k \sin k\psi) \tag{1}$$

Two-Line Equation:

$$\omega_n(x, \theta_x) = \frac{1}{\sqrt{r_1 r_2}} \int_0^x dx_2 \int_0^{x_2} dx_1 \cos n\psi_x(x_1 x_2)$$

$$\left[\frac{r_1 r_2}{p_1 p_2} (\phi_{n-1}(k_1) + \phi_{n+1}(k_1)) + 2\phi_n(k_1)\right] \tag{2}$$

Alignment of Equations in Series:

$$p(x) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left[-(x - \mu)^2/2\sigma^2\right]$$

$$p = (2\pi)^{-1/2} \int_{-\infty}^{x} \exp(-\tfrac{1}{2} t^2) dt \tag{3}$$

Alignment of Vertical Plus and Equal Signs:

$$\sum_2 (\psi_n, c_n) = 2c_2 \frac{\tan(2\psi_2 - \psi_1)}{\cos(2\psi_3 - \psi_2)} + 6c_3 \frac{\tan(2\psi_2 - \psi_2)}{\cos(2\psi_4 - \psi_3)}$$

$$+ 14c_4 \frac{\tan(2\psi_4 - \psi_3)}{\cos(2\psi_5 - \psi_2)} + \ldots$$

$$+ 2(2^1 + n - 1)c_n + 2 \frac{\tan(2\psi_{n+2} - \psi_{n+1})}{\cos(2\psi_{n+3} - \psi_{n+2})} \ldots \tag{4}$$

Figure A-18. Sample Equations and Formulas

Notation of Symbols:

$$N_R = \frac{\rho_f v d}{\mu} \qquad (5)$$

where

N_R = Reynolds number

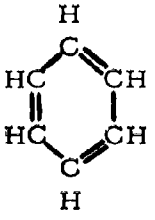
ρ_f = fluid density (pcf)

v = terminal velocity (ft/sec)

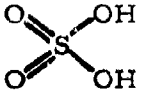
d = diameter (ft)

μ = fluid viscosity (lb/ft)

FORMULAS



Benzene



Sulfuric acid

Figure A-18. (Continued)

GREEK ALPHABET

Greek letter	Name	Corresponding English letter	Greek letter	Name	Corresponding English letter	Greek letter	Name	Corresponding English letter
α	alpha	a	ι	iota	i	ρ	rho	r, rh
β	beta	b	κ	kappa	k	σ (Σ)	sigma	s
γ	gamma	g	λ	lambda	l	τ	tau	t
δ (Δ)	delta	d	μ	mu	m	υ	upsilon	u, y
ε	epsilon	e	ν	nu	n	φ (Φ)	phi	ph
ζ	zeta	z	ξ	xi	x	χ	chi	ch
η	eta	ē	ο	omicron	o	ψ	psi	ps
θ	theta	th	π	pi	p	ω	omega	ō

Note: Letters in parentheses are most frequently used uppercase Greek letters.

Figure A-19. Sample Signs and Symbols, Greek Alphabet

MATHEMATICAL SIGNS

+	plus	≡	is identical with	-	vinculum (above letter)
-	minus	≢	not identical with	e	base (2.718) of natural logarithms
x	multiplied by	≠	not equal to	⟶	yields, approaches the limit
÷	divided by*	≈	nearly equal to	‖	absolute value
=	equal to, equals	⩾ or ≧	equal to or greater than	∴	hence, therefore
±	plus or minus	⩽ or ≦	equal to or less than	∵	since, because
∝	varies as	:	ratio	'	prime
∞	infinity	::	proportion	''	double prime (second prime)
∫	integral	·	multiplied by	Σ	sum
$\int_a^b$	integral between the limits a and b	<	less than	√	root, square root
~	difference	>	greater than	$\sqrt[3]{}$	cube root
		π	pi		

* Also indicated by writing the divisor under the dividend, with a line between.

Figure A-20. Sample Signs and Symbols, Mathematical Signs

APPENDIX B

LIST OF SCIENTIFIC AND TECHNICAL ABBREVIATIONS

SOURCE CODE:
1 - Government Printing Office Style Manual
2 - CSL Style Guide for Technical Publications
3 - Defense Atomic Support Agency Style Guide
4 - Style Book and Editorial Manual, Journal of the American Medical Association
5 - Other, including Configuration Management Handbook

A	Abbr.	Source
about	ca.	1,2
absolute (temperature and gravity)	abs	1,2
acceleration of gravity	g	2
acceptable quality level	AQL	5
acetylcholine	ACh	2
acetylcholinesterase	AChE	2
advanced development objective	ADO	5
advanced development plan	ADP	5
advanced production engineering	APE	5
alternating current	ac	2
altitude	alt	2
alpha particle	α	3
ampere	amp	2,4
ampere-hour	amp-hr	2,4
angle of elevation	AE	2
Ångstrom unit	Å	2,3
anhydrous	anhyd	2
anticholinesterase	antiChE	2
antilogarithm (common or Briggsian)	antilog	2
antilogarithm (natural or Naperian)	antiln	2
approximately	approx	2
aqueous	aq	2
atmosphere	atm	2,4
atomic number	at. no.	2
atomic mass unit	amu	2

	Abbr.	Source
atomic volume	at. vol.	2
atomic weight	at. wt.	2
attenuated total reflectance (IR)	ATR	5
audiofrequency	af	1,2
auxiliary	aux	2
average	avg	2
avoirdupois	avdp	1,2
B		
bar (except in combination)	bar	2,3
barn	b	1,2
basal metabolic rate	BMR	4
base ejection	BE	5
base detonating	BD	5
Basis of Issue	BOI	5
Baume'	Be	2
beats per minute	bpm	2
beats per second	bps	2
beta particle	β	3
billion electron volts	(Bev obsolete; see gigaelectronvolt)	1
blood pressure	BP	4
blood urea nitrogen	BUN	4
boiling point	bp	1,2
British thermal unit	Btu	1,2,3
C		
calculated	calc	5
caliber	cal.	5
calorie (small)	cal	1,2,3
per square centimeter	cal/cm^2	3
per square centimeter per second	cal/cm^2-sec	3

	Abbr.	Source
calorie (small) (contd)		
per minute	cal/min	3
per second	cal/sec	3
per hour	cal/hr	3
calorie (large = 1,000 cal)	Cal or kcal	2,3
candlepower	cp	2
Celsius (also centigrade)	C	1
centigram	cg	2
centiliter	cl	1,2
centimeter	cm	1,2,3,4
-gram-second	cgs	2,3,4
per second	cm/sec	2,3
per second per second	cm/sec^2	3
centipoise	cP	1
centistoke	cSt	1
central nervous system	CNS	2
cerebrospinal fluid	CSF	4
Chemical Agent Munitions Disposal System	CAMDS	5
Chemical Information and Data System	CIDS	5
chemically pure	CP	2
cholinesterase	ChE	2
circa (about)	ca.	2
circular error probable	CEP	2
circular mil	cmil	1
coefficient	coeff	2
Combat Development Objective Guide	CDOG	5
compare	cf	2
computer aided design	CAD	5
computer aided manufacturing	CAM	5

	Abbr.	Source
concentrated	conc	2
concentration	concn	2
concentration X time	Ct	2
concentrations X time	Ct's	2
configuration end item	CEI	5
Configuration Item Verification Review	CIVR	5
constant	const	2
continued	contd	2
Coordinated Test Program	CTP	5
counts per minute	counts/min	2,3
crystalline	cryst	2
cubic		
centimeter (liquid)	cc	2,4
centimeter (volume)	cm^3	1,2,3
foot	ft^3	1,3
foot per minute	ft^3/min	1
foot per second	ft^3/s	1
inch	in^3	1,3
meter	m^3	1,3
kilometer	km^3	1
micrometer*	μm^3	1
millimeter	mm^3	1,3
mile	mi^3	3
yard	yd^3	1,3
curie	curie or Ci	1,2
cycle (s)	cycle (s)	
per minute	cpm	2,3
per second	cps	2,3,4

* Government Style Manual: Micron is obsolete.

D	Abbr.	Source
decibel	dB	1
unit	dBu	1
decigram	dg	1
deciliter	dl	1,4
decimeter	dm	1,2,4
degree (of an arc or angle)	degree	3
degree centigrade (Celsius)	°C	1,2
degree Fahrenheit	°F	1,2
degree Kelvin	°K	2
degree Rankine	°R	1,2
Development Acceptance	DEVA	5
Development Acceptance Test	DAT	5
Development Objective	DO	5
diameter	diam	2
dilution	dln	2
dioctyl phthalate	DOP	2
direct current	dc	2,3
disintegrations	dis	3
per second	dis/sec	2
per minute	dis/min	3
distillation	distn	2
dram	dr	1,4
drawing	dwg	2
dyne	dyne	3
-centimeter	dyne-cm	3
E		
effective dose	ED	2
electrocardiogram	ECG, EKG	2
electroencephalogram	EEG	2

	Abbr.	Source
electromagnetic unit	emu	2
electromotive force	emf	1,2,3
electron volt	ev	2,3
electrostatic unit	esu	1,2,3
Engineering Change Notice	ECN	5
Engineering Change Order	ECO	5
Engineering Change Proposal	ECP	5
Engineering Change Request	ECR	5
Engineering Design Test	EDT	5
Engineering Parts List	EPL	5
Engineering Test/Service Test	ET/ST	5
Environmental Impact Assessment	EIA	5
Environmental Impact Statement	EIS	5
equilibrium	equil	2
equivalent	eq (noun only)	2
estimate	est	2
estimated	estd	2
et alii (and others)	et al.	1
exempli gratia (for example)	e.g.	1
F		
Fahrenheit	F	1,2,4
farad	f	2
female	F	4
figure	fig.	1
fissions per minute	fis/min	3
per second	fis/sec	2,3
foot (feet)	ft	1,2
per minute	ft/min	1,3
per second	ft/sec	3
per second per second	ft/sec^2	3
-candle	ft-candle	3
-pound	ft-lb	1,3
freezing point	fp	2
G		
gallon	gal	1,2,3,4

	Abbr.	Source
gallons per day	gal/day	3
per hour	gal/hr	3
per minute	gal/min	1,3
gastrointestinal	GI	2
gauss	G	1
Geiger-Mueller	G-M	2
general purpose	GP	2
giga (prefix: 1 billion)	G	1
gigaelectronvolt	Gev	1
Government furnished equipment	GFE	5
Government furnished material	GFM	5
grain	gr	1,2
gram	gm	2,4
-atom	gm-at.	2
-calorie	gm-cal	2,3
-mole	gm-mole	2
per cubic centimeter (liquid)	gm/cc	2
per cubic centimeter (volume)	gm/cm^3	3
per milliliter	gm/ml	2
per second	gm/sec	2
per square centimeter	gm/cm^2	3
gravity, acceleration of	g	1,2,4
ground zero	GZ	2,3
H		
half life	$t_{½}$	2
henry	h	2
hertz (cycles per second)	Hz	1
high explosive	HE	2,3
anti-tank	HEAT	
anti-tank with tracer	HEAT-T	
plastic	HEP	

	Abbr.	Source
high frequency	hf	2
horsepower	hp	1,2,3,4
-hour	hp-hr	2,3
hour	hr	2,4
I		
incapacitating concentration X time	ICt	2
incapacitating dose in 50% of exposed personnel	ID_{50}	5
inch	in	1,3,4
of mercury (conventional)	inHg	1
of water (conventional)	inH_2O	1
per second	in/sec	3
-pound	in-lb	1,3,4
indicated airspeed	ias	2
indicated horsepower	ihp	2
infrared	IR	2
inorganic	inorg	2
inside diameter	ID	2
insoluble	insol	2
intra-arterial	ia	2
intramuscular	im	2
intraperitoneal	ip	2
intratracheal	it	2
intravenous	iv	2
J		
joule	j	2
K		
Kelvin	K	1,4
kilo (prefix: 1,000)	k	1,3
kilobar	kb	2
kilocalorie	kcal	2,3
kilocycle	kc	1,2,3,4

	Abbr.	Source
kiloelectronvolt	kev	2,3,4
kilogram	kg	1,2,3,4
kilogram calorie	kg cal	2
kilogram-meter	kg-m	2,3
kilograms per minute	kg/min	2
per second	kg/sec	2
kilohertz (kilocycles per second)	kHz	1
kiloliter	kl	1,3
kilometer	km	1,2,3,4
kilometers per second	km/sec	2
kiloton	kt	1,2,3
kilovolt	kv	2,3,4
-ampere	kva	3
kilowatt	kw	2,3,4
-hour	kw-hr	2,3
kinetic energy	KE	2
L		
lambert	L	1,3
lethal area	A_L	2
per pound	A_L/lb	2
lethal concentration	LC	2
lethal concentration X time	LCt	2
lethal dose	LD	2
lethal time	Lt	2
liter	l or spell out	
per minute	l/min	
logarithm (common or Briggsian)	log	2
(natural or Naperian)	ln	2

M	Abbr.	Source
magnification	X (as 12X)	2
male	M	4
mass median diameter	MMD	2
mass unit	mu	2
maximum	max	2,3
mega (prefix: 1 million)	M	1,3
cycle	Mc	1,3
cycles per second	MHz (megahertz)	1
ton	Mt	1,2,3
volt-ampere	Mva	3
watt	Mw	3
melting point	mp	2
metabolic rate	MR	4
meter	m	1,2,3
per second	m/sec	3
-kilogram	m-kg	3
micro (prefix: 1 millionth)	μ	1,2,3,4
ampere	μa	2,3
barn	μb	2
curie	μC	2
equivalent	μeq	2
farad	μf	2,3,4
gram	μg	1,2,3,4
henry	μh	2,3
liter	μl	2,4
meter (replaces obsolete micron)	μm	1
micrometer (use of compound prefixes obsolete; see pico)	pm	1
molar	μM	2

	Abbr.	Source
micro (prefix: 1 millionth) (contd)		
mole	μmole	2
second	μsec	2,3
volt	μv	2,3,4
watt	μw	2,3
mil	mil	1,3
mile	mi	1,2
miles per hour	mph	2
milli (prefix: 1 thousandth)	m	1
ampere	ma	2
bar	mbar	5
barn	mb	2
curie	mC	2
equivalent	meq	1,2
farad	mf	2,4
gram	mg	1,2,3,4
gram minutes per cubic meter	mg min/m^3	5
gram per cubic meter	mg/m^3	5
gram per liter	mg/l	2
henry	mh	2,3
hertz	mHz	1
liter	ml	1,2,3,4
meter	mm	1,2,3,4
meter of mercury (conventional)	mmHg	1
microcurie	mμC	2
microgram	mμg	2
microliter	mμl	2
molar	mM	2
mole	mmole	2

	Abbr.	Source
milli (prefix: 1 thousandth) (contd)		
roentgen	mr	2,3,4
second	ms	2,4
volt	mv	2,3,4
watt	mw	2,3
million electron volts (megaelectronvolts)	Mev	2,3
minimal effective dose	MED	4
minimum (text)	spell out	
(tables, graphics)	min	2,3
minimum effective concentration	MEC	4
minimum lethal dose	MLD	4
minute (text)	spell out	
minute (tables, graphics)	min	1,2,4
molar	M	2,4
mole	spell out	2,4
molecular weight	mol wt	2
molecules per 100 electron volts	G	2
month	mo	1,2,4
N		
nano (prefix: 1 billionth)	n	1,2
gram	ng	2
meter (millimicron obsolete)	nm	1
National Formulary	NF	2
nonvolatile	nv	4
normal (concentration)	N	2
normal temperature and pressure	NTP	4
nuclear magnetic resonance	NMR	2
number	No.	2
numbers	Nos.	2

	Abbr.	Source
neutron (tables, graphics)	n	2,3
per square centimeter	n/cm^2	3
per square centimeter per second	$n/cm^2/sec$	5
O		
ohm	spell out	
-centimeter	ohm-cm	2
olive drab	od	2
ounce	oz	2
-foot	oz-ft	2,3
-inch	oz-in	3
outside diameter	OD	2
P		
page	p	1,2
pages	pp	1,2
paragraph	para	2
parts per million	ppm	2
percent	pct	1,3
(with numerals)	%	2
percutaneous	pc	2
pico (prefix: 1 trillionth)	p	1,2
point-detonating	PD	2
poise (in combination)	P	1
potential energy	PE	2
pounds(s)	lb	1,2,3,4
per square foot	psf	3
per square inch	psi	2,3
per square inch absolute	psia	2,3
per square inch gauge	psig	2,3
per cubic foot	pcf	3

	Abbr.	Source
pound(s) (contd)		
per horsepower	lb/hp	3
-moles per hour	lb-mole/hr	2
precipitate	ppt	2
precipitation	pptn	2
preparation	prepn	2
probable error	PE	2
probable circular error	CEP	2
probable error in deflection	PE_D	2
probable error in range	PE_R	2
probability	P	2
Q		
qualitative	qual	2
quantitative	quant	2
quart	qt	1,2,4
R		
radiation (absorbed dose) unit	rad	2
Rankine (degree)	R	1,2
red blood cell	RBC	2
relative biological effectiveness	RBE	2
reference	ref	2
(plural)	refs	2
refractive index at 20°C [sodium (D) line]	n_D^{20}	2
relative humidity	RH	2
revolutions per minute	rpm	2,3
per second	rps	2,3
roentgen	r	2,3
equivalent man (mammal)	rem	2,3,4
equivalent physical	rep	2,3,4

	Abbr.	Source
roentgens per day	r/day	2,3
per hour	r/hr	2,3
root mean square	rms	1,2,3
S		
saturation	satn	2
second	sec	2,4
section	(spell out)	2
sedimentation rate	sed rate	4
series	(spell out)	2
soluble	sol	2
solubility	soly	2
solution	soln	2
specification	spec	2
specific gravity	sp gr	2,3
specific heat	sp ht	2
specific volume	sp vol	2
square	sq	2
centimeter	cm^2	1,3
foot	ft^2	1,3
inch	in^2	1,3
kilometer	km^2	1,3
meter	m^2	1,3
millimeter	mm^2	1,3
yard	yd^2	1,3
standard	std	2
standard deviation	SD	2
standard error	SE	2
standard temperature and pressure	STP	2
subcutaneous	sc	2

	Abbr.	Source
Surgeon General	Surg. Gen.	1
T		
temperature	temp	2
tera (prefix: 1 trillion)	T	1,2
thousand	K	
U		
ultrahigh frequency	uhf	1,2
ultraviolet	UV	2
United States Pharmacopoeia	USP	2
V		
vapor density	vd	2
vapor pressure	vp	2
velocity (except in equations)	vel	2
very high frequency	vhf	1
versus	vs.	1
volt	v	2,4
-ampere	v-a	2
volume (except in equations)	vol	2
(plural)	vols	2
percent	vol %	4
-to-volume ratio	v/v	2
W		
watt	W	2,4
-hour	w-hr	2,3
per candle	w/candle	3
week	wk	2
weight	wt	2
percent	wt %	2
-to-volume ratio	w/v	2
-to-weight ratio	w/w	2

	Abbr.	Source
white blood cell	WBC	2,4
without	wo	2
Y		
yard	yd	1,2,3,4
year	yr	1,2,4
yield point	YP	2

APPENDIX C

CLEAR WRITING

INTRODUCTION

In 1846, Dr. W.T.G. Morton, a Boston dentist, used ether to put a patient to sleep during a tooth extraction. Not only did Morton call in other doctors to view the operation, but he published papers detailing his procedures, and for years he was believed to have been the first medical man to use an anaesthetic during an operation. Four years earlier, however, Dr. Crawford W. Long, a dentist in Jefferson, Georgia, had actually made the first use of ether as an anaesthetic. But Long failed to communicate his findings. As a result, he lost credit for his pioneering effort and, more importantly, he caused needless duplication of his work.

The Morton-Long case may be an extreme example. But it emphasizes an important point: the scientist or engineer must communicate the results of his studies. Further, he must be able to communicate them clearly, precisely, and concisely: clearly and precisely, so that his readers will receive his ideas as he conceived them and have no doubt about his meaning; concisely, to conserve the precious time his readers need for their own work.

PRECEDING PAGE NOT FILMED
BLANK

WRITING

Once you have organized your thoughts you must determine who your reader will be. The reader is all-important; he is the only reason for writing the report in the first place. If you ignore him, then writing is an exercise in futility.

Who will your reader be? Another scientist or technician with the same expertise as you? An administrative official with only slight acquaintance with your specialty? Most likely your writing will have a number of readers, some of them as knowledgeable as you, some not. Your paper, then, must be as close to being "all things to all men" as possible.

That doesn't mean you should "write down" to your reader. It does mean, however, that you should use easily understood words wherever possible; where you can't, you should define your terms. It means that you should write paragraphs that center around a collection of closely related thoughts, and a complete report that contains only information that bears on your central purpose.

Words — Economy is the watchword in government spending, and should be in government writing. If a procurement officer is worth his keep, he is not likely to spend 50 cents for an item that he could buy for 10 cents. Similarly, you should be thrifty in the words you use. In most cases the 10 cent word is preferable to the 50 cent word.

Such a 50 cent word is "utilize". For some reason, large numbers of government writers look down their noses at "use." But "use" does the job in half the time, and because it is a stronger word, gets better results. The same is true of other elegant-sounding, polysyllabic transplants from Greek and Latin that too many writers use in place of their Anglo-Saxon counterparts.

The important point in choosing words, however, is accuracy of expression. If a 50 cent word or a technical word is the only one that expresses your idea with absolute accuracy, use it. But use words sparingly. They often stop the reader in his tracks, make him puzzle over their meaning, and send him searching through a dictionary, if not scurrying for cover.

One key to accuracy – and simplicity of expression – is the use of concrete, specific words. The word "weapons", for example, may conjure a vision of rifles for the infantryman, cannon for the artilleryman. "Rifles" is a bit more specific but one solider may think of the M-1, while another sees himself behind an M-16. So it is necessary to write "M-16" when you mean the M-16. Leave no doubt in the reader's mind about what is going on in your mind.

To create the same ideas in the reader's mind as in your own you should also use words that express the exact meaning you wish to convey. If you aren't sure of the meaning of a word, look it up. Use the dictionary; it is the writer's best friend.

If you have an idea but can't think of the exact word to express it, or if the word you are thinking of does not seem to fit what you are saying, go to a thesaurus -- a listing of synonyms. (A word of caution about the thesaurus, however: a synonym does not always mean

exactly the same thing as the word it relates to. So do not use a synonym merely to avoid using the same word several times in the same sentence or paragraph. Be sure that the synonym does, indeed, express your idea.)

Correct use of words means fitting them to your reader, and that means the use of standard, everyday language. Elegant words have no place in a report; readers want information, not elegance. Neither are slang expressions acceptable. The best words are conventional, Anglo-Saxon, English words used in speech by educated people.

Sentences – If you can choose your words carefully you should have little difficulty in combining them into sentences. Back to the government writer. He likes to combine words in passive order: "Action was taken by this office." What he does not realize is that passive language indicates passivity on his part; it gives the impression that he is going through the paces.

Passivity also leads him into convoluted, roundabout sentences that make the reader feel like a rat bumping his way through a psychologist's maze.

Passive sentences create an undersirable impersonality in writing. The writer-reader relationship is a highly personal one, that of one person transferring his thoughts to another. Passivity weakens that relationship.

Action is at the heart of human endeavor and men write most naturally and most effectively when they express themselves actively: "This office took action" or better still: "We took action". Expressions of activity are best made through the simple subject-verb-object sentence form.

The active form, of course, is not always possible or even desirable because sometimes subjects are acted upon. In such cases, the passive form should be used. But when you are tempted to use the passive form, determine first whether the subject of your attention is an actuator or a recipient of action.

A basic rule to follow in deciding what to include in a sentence is "one idea to a sentence." Above all, because it is the basic unit of expression, the sentence should be unified.

Moreover, sentences containing only one idea are usually relatively short, and short sentences take your reader to your idea by the most direct route. They aid coherence because they contain fewer elements, thus simplifying the internal arrangement of ideas. And with fewer elements you are less likely to strangle your reader's mind with involved qualifications. If a subject needs to be qualified, put the qualifiers in a separate sentence. Short sentences also benefit coherence in that they steer you away from unnecessarily repeating yourself.

Finally, short sentences add emphasis to writing, particularly when they are placed next to longer sentences. If you wish your reader to remember a particular point, develop it with a relatively long sentence. Then hit him with the main point, concisely.

The short sentence rule, however, is not hard and fast; in fact, it should be bent. A succession of short sentences can tire and bore your reader with their sing-song effect. So it is usually a good idea to vary sentence length to give your readers psychological relief.

One further point should be made. The most prominent positions in the sentence are at the beginning and at the end. Thus you should put the most important words, those you wish to stress, in one of those positions.

Paragraphs – Many of the same principles that apply to sentence construction apply also to paragraphs. The essential feature of the paragraph is its unity. It expresses and develops one idea and, as such, it revolves around a topic sentence which holds that main idea. The topic sentence may come first, last, or within the paragraph, but wherever it is placed it is the key to the rest of the paragraph.

Like sentences, paragraphs generally should be kept short. If you seek completeness of expression at the same time you are aiming at conciseness, your paragraphs will be economical and easy to read.

Your paragraphs should also be coherent. Each sentence must relate to the sentences preceding and following it and, of course, to the topic of the paragraph.

You may achieve emphasis in paragraphing in three ways. As with sentences, you can stress particular points by placing them in a short paragraph which follows a longer one. You may give more paragraph space to more important ideas. Or you may indicate emphasis by positioning your most important points at the beginning and end of the paragraph.

Keep in mind that paragraphs are not isolated units but relate to one another logically and smoothly, and these relations require easy transitions between paragraphs. Sometimes the subject matter of the paragraph will be closely allied in thought with the preceding paragraph and in such cases the paragraphs can be said to have internal transition. When internal transition is not present, you may indicate transition by repeating a word or phase from the preceding paragraph. In other cases, such as to show contrast or comparison, a transition word or phrase may be necessary.

Sections – Unity is the essential feature of spearate sections of the report and the report as a whole. Each section should revolve around a single aspect of the matter being discussed. For example, in your discussion of material used in an experiment you may be tempted to talk about your results, but you should not.

Be certain, however, that your sections and your report as a whole are complete. Constantly keep your reader in mind and ask yourself the questions he might ask. Do not assume that he is as familiar with your procedures and results as you are; his lack of knowledge is precisely the reason why you are writing your report.

REVISING

The final step in report writing, and a most painful one, is revision – checking your report for completeness, correctness, conciseness, clarity, precision, and polish. No report will have all six elements in the first draft and it may be necessary to prepare a second, third or fourth draft, editing each in turn, before deciding you are finished.

It is a good idea to put your first draft aside for several days after writing, if you can, and turn your thoughts to something else. When you return to the report to revise it, you will be able to look at it with more detachment and see the matters that need attention more clearly.

The first check should be for completeness. You should ask yourself questions you asked during writing: "Is everything essential to understanding included?" "What questions will the reader have?" Only you can answer these questions; you are most familiar with the material you are writing about.

The check for correctness means a careful attention to facts. Are the formulas accurate? Are correct symbols used? Are statements valid?

Making your writing concise is the most difficult part of the revision process. Of all those beautiful words you so laboriously put down, many will be necessary to understanding and have to be cut. Cutting calls for a ruthless pencil, one that slashes out words and phrases, perhaps even entire paragraphs, without cringing.

The search for precision involves zeroing in on individual words and sentences to insure that they say exactly what you want to convey. "Is this the word that best expresses my idea?" "Is this group of words so put together that the reader cannot possibly misconstrue my meaning?"

All of the foregoing exercises, of course, will contribute to clarity. But you can further insure clarity of expression by considering the sentences and paragraphs as complete, though interdependent, units. "Do they center on single points?" "Are they so constructed that the ideas in them relate to what has gone before?"

When you can finally answer yes to all of those questions, another reading is in order. You should make one last check to make certain that you have made the proper choices of words, that your sentences are not sing-songy and will not lull the reader to sleep, and that there are no long and involved sentences that hide the meaning of what you are trying to say. Then, hopefully, you will have a report that communicates.

FOR EXAMPLE:

As an exercise in clear writing, here is how a Disposition Form was rewritten. The original was an actual DF: fictitious names are used here. Compare the original (276 words) with the revision (136 words).

Original

"1. Alston Arsenal has been directed to support a troop exercise known as FOG IV. This exercise will be conducted at Camp Chaos, California, during May-June 1970. Our support will involve the provision of training agents and dissemination devices, defensive equipment, Technical personnel at the exercise site to support equipment and to provide training as required.

"2. It is my desire that all concerned elements give strict attention to this program and take whatever action is necessary to furnish the required material and support to the test site when needed, i.e., about 15 April 1970. Should you foresee any difficulty in your area of responsibility with respect to the support of FOG IV, it should be brought to my attention immediately.

"3. In order that Alston Arsenal may be responsive to this requirement, I have appointed Mr. Mortimer Schnabel, Commodity Coordination Office, as the Alston Arsenal Critical Item Manager, effective this date. In this capacity he will provide staff guidance and centralized management for all Alston Arsenal activities relating to FOG IV.

"4. To assist Mr. Schnabel in carrying out this assignment, it is requested that your Directorate/Laboratory provide the names of a principal and alternate for representing your activity in accomplishing those phases of FOG IV for which you have mission responsibility. These representatives should be empowered to represent your Directorate/Laboratory in the making of timely decisions affecting your element and assuring that the tasks assigned to your Directorate/Laboratory are carried out.

"5. Copies of all documents/inquiries received or initiated by your activity and advice received regarding meetings to be held or visits to be made on this program should be provided to Mr. Schnabel."

Revision

"1. Alston Arsenal will support troop exercise FOG IV at Camp Chaos, California, in May and June 1970. We will provide training agents, dissemination devices, defensive equipment, technical support, and any needed training.

"2. Each directorate and laboratory will name a principal representative and an alternate to insure that its support assignment is carried out by the start of the exercise (about 15 Apr). They will assist Mr. Mortimer Schnabel, Commodity Coordination Office, the Alston Arsenal Critical Item Manager for FOG IV, who will provide staff guidance and coordinate all arsenal support. All matters concerning the exercise, including information copies of correspondence relating to it, should be directed to him.

"3. I wish all arsenal elements involved to cooperate fully in FOG IV. Therefore, if you anticipate any difficulties in fulfilling your assignment, bring them to my attention immediately."

DISTRIBUTION LIST FOR ARCSL-SP-80001

Names	Copies
Commander/Director	
Chemical Systems Laboratory	
ATTN: DRDAR-CLA	1
ATTN: DRDAR-CLA (Pub Stkrm)	100
ATTN: DRDAR-CLB	20
ATTN: DRDAR-CLC	16
ATTN: DRDAR-CLD	1
ATTN: DRDAR-CLF	1
ATTN: DRDAR-CLI	1
ATTN: DRDAR-CLJ	1
ATTN: DRDAR-CLJ-B	1
ATTN: DRDAR-CLJ-E	1
ATTN: DRDAR-CLJ-L	3
ATTN: DRDAR-CLJ-M	2
ATTN: DRDAR-CLJ-P	1
ATTN: DRDAR-CLJ-R	300
ATTN: DRDAR-CLJ-S	1
ATTN: DRDAR-CLN	15
ATTN: DRDAR-CLP	1
ATTN: DRDAR-CLS	1
ATTN: DRDAR-CLT	5
ATTN: DRDAR-CLW	15
ATTN: DRDAR-CLY	11
US Army Biomedical Laboratory	
ATTN: SGRD-UV	2
ATTN: SGRD-UV-R (Library)	2
ARRADCOM Support Elements	
ATTN: DRDAR-ACW	3
ATTN: DRDAR-MSE	1
ATTN: DRDAR-PA	2
ATTN: DRDAR-PMV	1
ATTN: DRDAR-PRB	50
ATTN: DRDAR-QAC	2
ATTN: DRDAR-QAC-E	2
ATTN: DRDAR-SEI-C	1
ATTN: DRDAR-TSC	3
ARRCOM Detached Elements	
ATTN: DRSAR-MAD-E	1
ATTN: DRSAR-MAS-C	1
Defense Technical Information Center	
ATTN: DTIC-DDA-2	12
Cameron Station, Bldg. 5	
Alexandria, VA 22314	
USA Toxic & Hazardous Materials Agency	
ATTN: DRXTH-TS	2
Commander	
US Army Armament Research and Development Command	
ATTN: DRDAR-TSS	2
Dover, NJ 07801	
Director	
Ballistic Research Laboratory	
ATTN: DRDAR-TSB-S	1
Aberdeen Proving Ground, MD 21005	
Director	
Benet Weapons Laboratory	
ATTN: DRDAR-LCB-TL	1
Watervliet, NY 12189	

PRECEDING PAGE NOT FILMED
BLANK